UNITED STATES DEPARTMENT OF AGRICULTURE

AGRICULTURAL RESEARCH SERVICE

ANIMAL HUSBANDRY RESEARCH DIVISION

and

COOPERATING SOUTHERN STATES

1967-1968 Annual Report of S-10

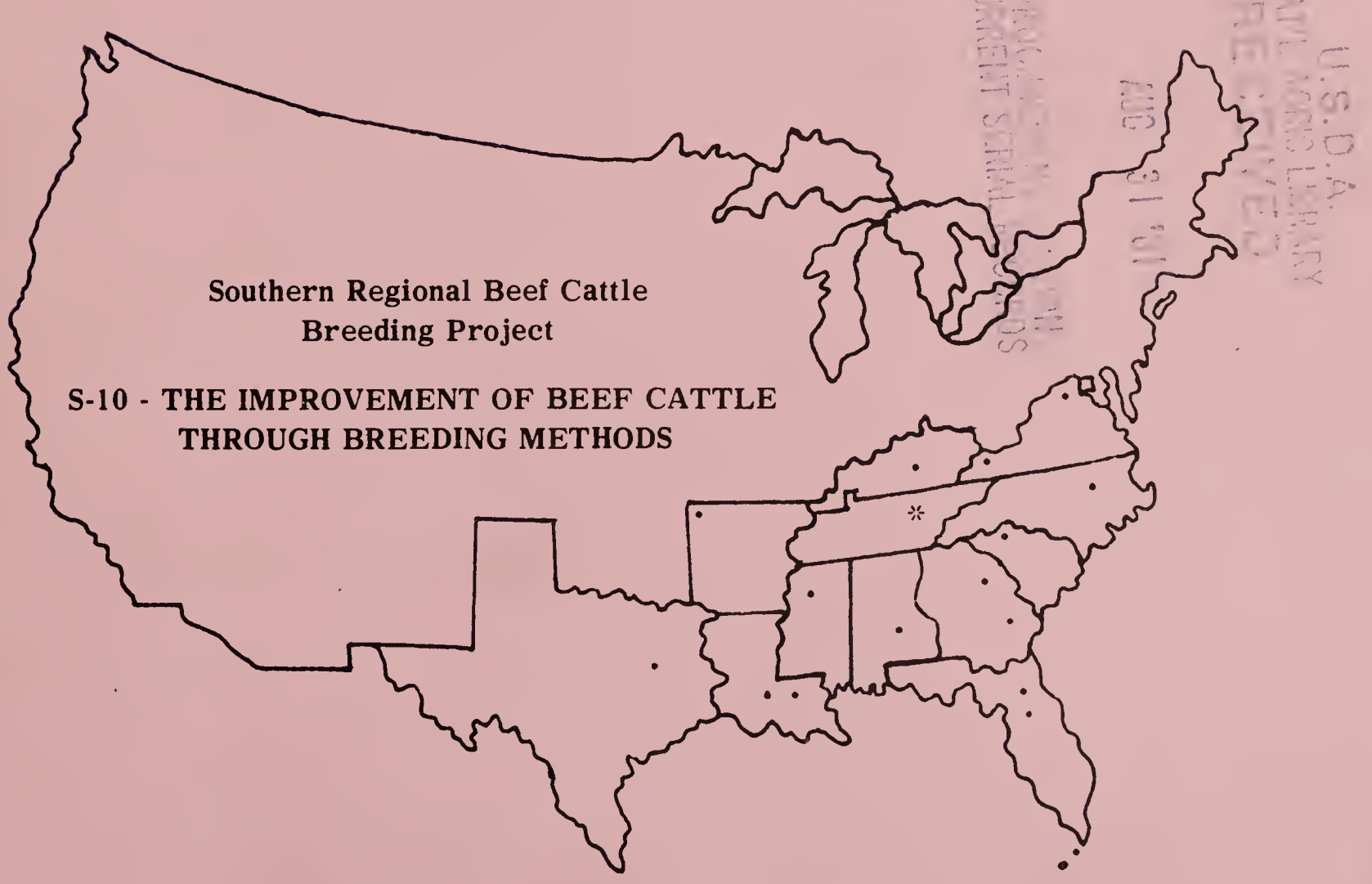
and

Report of Annual Technical Committee Meeting

University of Florida

Gainesville, Florida

June 10-13, 1968



This report is intended for the use of administrative leaders and workers and is not for general publication.

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INTRODUCTION

This project was initiated in 1948 to investigate and develop methods of breeding more productive beef cattle for the South. Detailed annual reports showing research developments and progress in each state have been prepared each year since 1950. Complete results of certain phases of the project have been reported in regional bulletins and technical articles and bulletins published by workers in the various states which contribute to the S-10 project.

This publication includes the proceedings of the 1968 annual meeting of the S-10 Technical Committee and the annual reports of projects in each of the 12 contributing states. The annual reports of S-10 contributing and supporting projects were prepared by the project leaders and other personnel at the various stations as summaries of the research developments and progress at each station during 1967. The results are not considered final, but the materials aid cooperators in developing an integrated program. This report also provides information needed by heads of animal husbandry departments, experiment station directors, and U. S. Department of Agriculture officials for evaluation of the projects with respect to objectives and procedures. <u>This report is not for the general distribution, and material contained in it should not be quoted in publications.</u>

ANNUAL MEETING OF TECHNICAL COMMITTEE
REGIONAL PROJECT S-10
University of Florida
June 10-13, 1968

Monday, June 10

7:00	AM	Visit - Adams Ranch, Mr. Alto Adams, Fort Pierce, Fla.
9:45	AM	Visit - Monreve Ranch, Mr. Dick Kelley, Stuart, Fla.
12:00	Noon	Lunch - Holiday Inn, Belle Glade, Fla. (Courtesy Big B Ranch)
1:00	PM	Visit - Everglades Experiment Station, Belle Glade, Fla.
2:00	PM	Visit - Big B Ranch, Belle Glade, Fla.
4:00	PM	Visit - Sugarland Ranch, U. S. Sugar Corp., Clewiston, Fla.
7:00	PM	Social Hour and Dinner - Clewiston Inn (Courtesy U. S. Sugar Corporation) Forum on Beef Cattle Production in South Florida (Led by Dr. Joe Crockett)

Tuesday, June 11

8:40	AM	Visit - Seminole Indian Reservation, Brighton, Fla.
12:00	Noon	Visit - K Bar Ranch, Mr. Henry Douglas, Zephrhills, Fla. (Lunch - Courtesy K Bar Ranch)
3:00	PM	Brooksville Beef Cattle Research Station, Brooksville, Fla.
7:00	PM	Arrive Gainesville Fla.

Wednesday, June 12

Presiding: J. A. Gaines

9:00	AM	Executive Committee meeting - Room 150 F , J. Wayne Reitz Union Building
10:00	AM	Assemble - Room 3471 J. Wayne Reitz Union Building Station Reports Mississippi - C. E. Lindley North Carolina - J. E. Legates, W. T. Ahlscwede
12:00	Noon	Lunch

Presiding: J. E. Legates

1:15	PM	Assemble Station Reports South Carolina - W. C. Godley, J. R. Hill Tennessee - C. S. Hobbs, R. R. Shrode Texas - T. C. Cartwright Virginia - J. A. Gaines Discussion
3:30	PM	Presiding: Bill Turner Review of new project proposals and priorities in research areas Report from S-10 Investigations Leader - Will T. Butts, Jr.
5:30	PM	Adjourn

Thursday, June 13

8:00 AM — Visit - Beef Research Unit

9:30 AM — Assemble

- Report from S-10 Administrative Advisor - Doyle Chambers
- Report from An. Hus. Res. Div. - P. A. Putnam
- Report from Coop. State Research Service - C. F. Sierk
- Final Business Session
  - Committee Reports
  - Site for 1969 meeting
  - Old Business
  - New Business
  - Chairman's Report

Adjourn

MINUTES OF S-10 EXECUTIVE COMMITTEE MEETING

Gainesville, Florida

June 12, 1968

The Executive Committee meeting was called to order by Dr. Gaines at 9:00 A.M. in Room 150 of the J. Wayne Reitz Union Building on the University of Florida campus. He appointed Dr. W. C. Godley to prepare and present resolutions for the Business Meeting.

Dr. Butts inquired about procedures for approval of state contributing projects. In reply, Dr. Sierk reported that if the state's project was in harmony with the regional objectives, no new addendum was required. However, if the new state's project's objectives are beyond the regional project, then additional action in the form of an addendum is needed to permit inclusion of the state project. The S-10 Regional Project outline was revised and approved in 1965. When individual state projects have been approved by regional committees, the Regional Administrative Advisor is to forward notification of such approval to the Director of the Experiment Station.

The program for the Technical Committee Session was reviewed, and there being no further business the meeting was adjourned in advance of the Technical Committee meeting.

Respectfully submitted,

J. E. Legates

MINUTES OF S-10 TECHNICAL COMMITTEE MEETING

Gainesville, Florida
June 10 - 13, 1968

Chairman J. A. Gaines called the meeting to order at 10:00 A.M. on June 12, in Room 150 of the J. Wayne Reitz Union Building on the campus of the University of Florida. The following Technical Committee representatives were present:

Alabama - T. B. Patterson, Auburn Univ., Auburn
Arkansas - C. J. Brown, U. of Arkansas, Fayetteville
Florida - M. Koger, U. of Florida, Gainesville
Georgia - W. C. McCormick, Georgia Coastal Plain Expt. Sta., Tifton
Kentucky - Fred Thrift, U. of Kentucky, Lexington
Louisiana - J. W. Turner, L.S.U., Baton Rouge
Mississippi - C. E. Lindley, Mississippi State Univ., State College
North Carolina - J. E. Legates, N. C.State Univ., Raleigh
South Carolina - W. C. Godley, Clemson Univ., Clemson
Tennessee - C. S. Hobbs, U. of Tenn., Knoxville
Texas - T. C. Cartwright, Texas A&M Univ., College Station
Virginia - J. A. Gaines, Va. Polytechnic Inst., Blacksburg

Other agencies and leaders:

Administrative Adviser - Doyle Chambers, L.S.U. Agr. Expt. Sta., Baton Rouge
CSRS Representative - C. F. Sierk, USDA, Washington, D.C.
AHRD-USDA - Paul A. Putnam, USDA, Beltsville, Maryland
Investigations Leader - Will T. Butts, Jr. AHRD, U. of Tenn. Knoxville

Others in attendance were:

Robert R. Shrode, University of Tennessee, Knoxville, Tenn.
Bill Brown, University of Tennessee, Knoxville, Tennessee
W. T. Ahlschwede, North Carolina State Univ., Raleigh, N. C.
James Riley Hill, Jr., Clemson Univ., Clemson, S. C.
Ruel Wilson, USDA, Biometrics, Beltsville, Md.
David C. Meyerhoeffer, Iberia Station, Jeanerette, Louisiana
J. Ralph Overfield, Western Kentucky Substation, Princeton, Kentucky
H. A. Fitzhugh, Jr., Texas A & M University, College Station, Texas
R. C. Thomas, Texas Agri. Expt. Sta.
Charles J. Wilcox, University of Florida, Gainesville, Florida
W. C. Burns, Beef Cattle Research Station, Brooksville, Florida
J. Hentges, Jr., University of Florida, Gainesville, Fla.
R. D. Scarth, University of Georgia, Athens, Georgia
Hollis Chapman, Coastal Plain Expt. Sta., Tifton, Georgia
R. S. Lowery, Coastal Plain Expt. Sta., Tifton, Georgia
T. M. DeRouen, Iberia Station, Jeanerette, Louisiana
J. R. Crockett, Everglades Expt., Sta., Belle Glade, Florida
Richard McDonald, L.S.U., Baton Rouge, Louisiana
Anthony F. Gilek, University of Florida, Gainesville, Florida
Juan J. Salazar, University of Florida, Gainesville, Florida
A. M. Mullins, Louisiana State University, Baton Rouge, Louisiana

Chairman Gaines announced that he felt the current standing committees on data collection and analysis, standardization of carcass and meat, and the annual report were superfluous. Without objection he announced that these committees were hereby being dissolved.

For the remainder of the morning and continuing after lunch, the several Station Representatives reported on their projects as indicated in the program preceeding these minutes.

Following the presentation of these Station reports, Dr. Bill Turner led a discussion of new project proposals and priorities for research. Dr. Legates presented the objectives and procedures for the proposed North Carolina project. This proposal had been distributed at the previous annual meeting and suggestions had been received from Florida, Georgia, Kentucky, Louisiana, Tennessee and Virginia. In addition, Dr. Butts had visited North Carolina and discussed a further revision of the project. An extended discussion of the North Carolina project on selection for preweaning and postweaning gains followed.

Dr. J. R. Hill introduced a project from the South Carolina Station that they anticipate presenting to the Technical Committee for its consideration. This project is entitled "The influence of exogenous progestins on fertilization, embryo survival and reproductive physiology of the bovine female". A team focusing on reproductive problems in the bovine has been developed at Clemson, and the South Carolina workers felt that a contribution could be made to the regional project in this area.

It was suggested that this project and future projects to be submitted for Technical Committee approval follow the general pattern of presentation of the North Carolina proposal. In this respect the project outline should be made available to the Technical Committee members for suggestions and recommendations in advance of the forthcoming technical committee meeting, then the project proposal would be open for discussion at the Technical Committee sessions prior to a vote at the Business meeting.

In addition to the South Carolina project, Dr. Thrift indicated that Kentucky was developing a revision of their proposal and hoped to have it available for consideration during the coming year.

The session was then opened to consider new areas for research. Some of the questions raised were:

1. What are the problems that are pertinent to large scale beef cattle operations? Do we also need to give emphasis to smaller operations that cannot follow a fully integrated program from calf to the slaughter house? Discussion reflected that while large operations are dominating, there are still a number of areas where smaller herds will continue.

2. What are some of the problems involved in identifying superior genotypes? There is a particular need to define precisely the criterion for selection. This problem becomes extremely important when selecting sires for wide spread use in artificial insemination.

3. Quality of product has been given a high rating by the beef cattle task force group. How is quality to be measured by those responsible for breeding programs?

4. How much milk is essential for an efficient beef operation? We hear much about too little milk. Is it possible that too much milk may be available in certain instances, thereby damaging the later productivity of breeding females? The question regarding the relationship between maternal performance, largely milking ability, and growth potential has yet to be resolved satisfactorily.

5. What problems are involved in the economics of beef cattle operations? A shift in the source of nutrients, that is roughage versus concentrates, is apparent although no one can predict when measurable changes will be forced upon us. Consideration of overall efficiency on a land use basis as well as individual efficiency in terms of pounds of lean in relationship to nutrients required for input was discussed in connection with the potential program for the Brooksville Station. It was agreed that additional and more precise measures of efficiency were desirable, but no specific recommendation evolved from the discussion. Dr. Gaines indicated a special interest in further study of efficiency of feed utilization. A detailed examination of this question could provide an opportunity to pool data for a joint regional effort. He volunteered to work on this problem providing others in the region were willing to make available data on feed consumption, gain and associated variables needed for such an analysis.

Chairman Gaines called the Business Meeting to order at 9:30 A.M. on June 13 following the group's visit to the Beef Research Unit. Dr. Chambers, the Committee's Administrative Advisor, spoke to the group on the following points:

1. The beef cattle task force group has made a thorough and comprehensive study in the beef cattle industry. In viewing the needs of the industry, priorities have been given various areas of beef cattle research. This task force report should be available later this year and copies made accessible to Technical Committee members.

2. Regional research does not necessarily have to be supported by regional research funds. Projects that are contributing to regional activities may be fully supported by state funds. In some instances, directors have reduced the number of projects receiving regional funds in order to streamline budget procedures. However, project leaders should not interpret projects as being superior or inferior on the basis of whether or not they are allocated regional research funds. A regional dollar will not buy more than a dollar from state appropriations.

3. Dr. Chambers has been concerned that the Committee of Nine has indicated a five year maximum length for research projects. Such a five year limitation is unreasonable for regional breeding projects. He is working to obtain a deletion of this requirement.

Dr. Paul A. Putnam, acting head of the Beef Cattle Research Branch, reported for the Animal Husbandry Research Division in Dr. Warwick's absence. He announced that Dr. Warwick had been made an Assistant Director of the Animal Husbandry Research Division with responsibility for the beef cattle, sheep and swine divisions plus the Clay Center Operation and the Pioneering Laboratories. He expressed his pleasure at being able to visit with the group and indicated that Dr. Warwick sends his

regrets for not being able to attend. Dr. Putnam indicated that all of the budgetary details for next year had not been approved, but they hoped the financial picture for next year would be at least at the same level as for the previous year. In considering financial support, as well as topics for research, he indicated that we need to have concern for the general public, as well as the producers. With large urban and consumer groups, and the declining number of producers, our situation becomes politically more difficult each day.

In commenting on the need for regional research, he recognized the need for reasonable replication, but cautioned against excessive duplication. In this regard, he cited a summary by Dr. J. P. Maule of the Animal Breeding and Research Organization who had recently visited this country. Dr. Maule had the opinion that much work on crossbreeding represented a duplication rather than a replication, and it was important that our resources for large animal research be deployed wisely.

Dr. Carl Sierk spoke for the Cooperative State Research Service. He indicated his pleasure at renewing relations with the S-10 Committee. He was unable to participate in the tour preceeding our committee sessions, since he had to work with the Planning Committee for the forthcoming World Conference on Animal Production. Some of the points which he discussed were:

1. Funding for this fiscal year is anticipated to be essentially the same as for last year. The total Department of Agriculture budget from the President's office was for 6.9 billion dollars. The House had only recommended 5.5 billion, although the Senate had been somewhat more generous. The final figure, of course, will develop in consultation between the House and the Senate Committees.

2. The Task Force report covering the National program for agriculture was well accepted by administrative and political officials. The goals appear to be realistic, but money must be available to obtain the stated goals. 1970 budget requests are in progress and they are to include one-third of the 1969-72 projected increases.

3. The manual of procedures for regional research is to be revised. The Committee of Nine is working with the CSRS to develop this revision.

4. Whether we realize it or not, Congress looks to regional funds as a distinct entity. Special justification is generally needed for these funds. Approximately 200 regional projects are in force throughout the nation, and the Committee of Nine and the Cooperative State Research Service are anxious to have strong projects truly regional in nature.

5. Dr. Sierk reminded the group that areas of regional research may be identified without regional funding. Provisions have been made to permit regional exchanges of information on an informal basis where two or more stations are interested in a common research area, even though the regional project may not be approved, nor regional funding supports the research.

The minutes of last year's meeting were discussed and approved as previously circulated.

Dr. Gaines indicated that he had received a letter from Dr. Dinkle indicating that with so few facilities available at Clay Center, it probably would be more profitable to visit there after 1969. Hence, the joint meeting of the S-10, NC-1 and W-1 Committees for 1969 appeared out of the picture. Invitations for next year's meeting were received from North Carolina and Arkansas. The invitation to meet at North Carolina was accepted.

It was moved that the North Carolina project, which had been discussed earlier, be approved as contributing to the regional effort. This motion was seconded and carried. Chairman Gaines again indicated that Kentucky and South Carolina would have new projects to be considered during the year. They should be circulated to the Technical Committee for suggestions and subsequent discussion at next year's annual meeting.

A bit of lively voting and solid competition followed for the new Executive Committee member. Dr. R. R. Shrode of Tennessee was elected to the Executive Committee. The following resolutions were submitted by Dr. W. C. Godley. They were approved as presented.

Report of the Resolutions Committee

Be it resolved that the S-10 Technical Committee express its appreciation to Dr. Marvin Koger and the staff of the Animal Science Department, University of Florida for the arrangements, the visit to the Beef Cattle Research Unit and the hospitality that we enjoyed during the meetings. Special appreciation is accorded Mr. Cal Burns and Dr. Joe Crockett for arranging and leading the extremely interesting and informative tour on June 10th and 11th.

Be it further resolved that the Technical Committee express its special thanks to Mr. Alto Adams, Mr. Dick Kelley, Mr. Alvaro Sanchez, Jr., Mr. Pablo Vinent, Dr. Herb Lloyd, Mr. S. L. Crochet, Dr. Mike Milicevic, Dr. Dan Beardsley, Mr. Fred Monstedoca, Mr. Henry Gopher and Mr. Henry Douglas for allowing us to visit their operations and for answering our many questions concerning all phases of their programs.

Be it further resolved that the Committee express its sincere thanks to the Big B Ranch and the K Bar Ranch for the excellent lunches on June 10th and 11th, and to the U. S. Sugar Corporation for the fine dinner on June 10th that we enjoyed so much.

It is recommended that a copy of these resolutions, as appropriate, be sent to each of those mentioned in the resolution and to Dr. John W. Sites, Dean of Agricultural Research, Institute of Food and Agricultural Science, Gainesville, Florida.

Respectfully submitted,

W. C. Godley

A brief exchange of ideas concerning the program for next year's annual meeting followed. The general consensus was that in addition to the scheduled committee reports and visit of facilities, an attempt should be made to discuss basic genetic aspects and new approaches to beef cattle improvement. It was recommended that these points be kept in mind when next year's program was developed.

There being no further business, the meeting was adjourned at 11:00 A.M. The members for the Executive Committee for next year are: J. E. Legates, Chairman; J. W. Turner, Secretary; R. R. Shrode.

Respectfully submitted,

J. E. Legates, Secretary

ANNUAL REPORT OF COOPERATIVE REGIONAL PROJECT
January 1 to December 31, 1968

1. PROJECT: S-10 Improvement of Beef Cattle through Breeding Methods

2. COOPERATING AGENCIES AND PRINCIPAL LEADERS:

Cooperating State Experiment Stations and Technical Committee:

Alabama	T. B. Patterson
Arkansas	C. J. Brown
Florida	Marvin Koger
Georgia	W. C. McCormick
Kentucky	Fred Thrift
Louisiana	J. W. Turner
Mississippi	C. E. Lindley
North Carolina	J. E. Legates
South Carolina	W. C. Godley
Tennessee	C. S. Hobbs
Texas	T. C. Cartwright
Virginia	J. A. Gaines

U. S. Department of Agriculture Agencies and Leaders:

P. A. Putnam, Beef Cattle Research Branch, AHRD, ARS, Beltsville, Maryland

W. T. Butts, Jr., Investigations Leader, S-10, AHRD, Knoxville, Tennessee

W. C. Burns, Superintendent, West Central Florida Experiment Station, Brooksville, Florida

D. C. Meyerhoeffer, Superintendent, Iberia Livestock Experiment Station, Jeanerette, Louisiana

B. M. Priode, Superintendent, Beef Cattle Research Station, Front Royal, Virginia

C. F. Sierk, Cooperative State Research Service, Washington, D.C.

Regional Officers, 1967-68:

Doyle Chambers, Administrative Advisor, Baton Rouge, Louisiana

J. A. Gaines, Chairman, Blacksburg, Virginia

J. E. Legates, Secretary, Raleigh, North Carolina

J. W. Turner, Executive Committee Member, Baton Rouge, Louisiana

3. PROGRESS OF THE WORK AND PRINCIPAL ACCOMPLISHMENTS:

This project is the focal point of Federal-State cooperative effort in beef cattle breeding in the Southeast and includes research on (1) developing methods of measuring economically important traits; (2) determining genetic parameters of these traits; (3) comparing effectiveness of different breeding systems; (4) comparing the productivity of existing breeds and strains under varying environmental conditions; and (5) determining the mode of inheritance of qualitative defects. Progress was reported under all five of these objectives, with major emphasis on the determination of genetic parameters and the comparison of different breeding systems. Ten journal articles, 3 state experiment station bulletins and 48 theses, abstracts, and miscellaneous publications were reported by institutions contributing to the S-10 project.

In a study of weight-age curves, Texas reported genetic, phenotypic and environmental correlations exceeding 0.93 between the initial proliferation rate of body mass and the rate at which asymptotic weight is approached. Weight at the point of inflection was a direct function of asymptotic weight and did not

appear to be affected by environment. Further work by the same station based on simulated data indicated that mass selection for growth rate over constant weight or age intervals would be expected to increase growth rate and mature size, decrease rate of maturing but to have no effect on intrinsic feed efficiency. However, selection for growth rate while restricting change in mature size would be expected to increase growth rate, earliness of maturing, feed efficiency and/or appetite. It was concluded, also, that slaughter cattle from different size parents should be slaughtered at different weights for optimum utilization of nutrients. When so evaluated, a wide range in cow size was found to exhibit nearly equal suitability in a straightbred operation. The cooperative, S-10 immunogenetics lab at the Texas station reported 39 reagents and 55 antisera presently available. Blood samples from inbred lines at Tennessee and Virginia were evaluated. A study to determine milk protein polymorphism was initiated.

In efforts to more adequately partition gain into its genetic and environmental components, Tennessee observed change in cow fat during the nursing period to be associated with variation in weaning condition scores of calves but not with preweaning ADG. North Carolina found postweaning gain of bulls to 365 days of age to be unaffected by age of dam. Jeanerette reported early indications of separation in fat thickness between lines selected for and against fat. Postweaning gains of bulls favor the low fat lines. Important additive effects for both growth and maternal influences on birth weight were found in analyses of accumulated data at the Arkansas station. An antagonism between the two effects on birth weight was suggested. South Caroline failed to detect a negative relationship between preweaning growth rate of heifers and the maternal environment subsequently provided by them as dams. Texas work indicated significant genetic variation for feed efficiency independent of appetite. Eight-seven steers by 17 sires were fed an amount which all contemporaries would consume.

Field work on major phases of crossbreeding projects was completed at two locations. Preliminary conclusions from a Virginia study comparing crossbred and straightbred cows producing crossbred calves are: (1) no difference in percent calves weaned, (2) weaning weights 13 and 23 pounds for males and females, respectively, in favor of crossbred dams and (3) carcass weights 16 and 13 pounds in favor of crossbred dams. Alabama reported seven years results comparing cattle of the following breed compositions: (1) Hereford control; (2) 3/4 Hereford, 1/4 Angus; (3) 1/4 Hereford, 3/4 Angus; and (4) 7/8 Hereford, 1/8 Brahman. Compared with the Hereford control, the differences at weaning were 60, 50 and 24 pounds, respectively, in favor of the crossbred groups. Final shrunk weight of steer calves following growing and finishing phases favored the above crossbred groups by 33, 43 and 19 pounds, respectively. However, costs of postweaning gains were reported to be approximately 3, 2 and 1 dollars/cwt higher for the crossbred groups than the Hereford control. Alabama and Louisiana reported heavier weaning weights for three-breed crosses than for two-breed crosses. These differences were generally greater at weaning than at slaughter. Considerable variation in growth rate is apparent among inbred lines of British breeds at the Front Royal station. Sires from these lines are being bred in test herds in Mississippi and Virginia. A line's own performance presently appears to be a reliable indicator of its breeding value in the test herd.

Useful data were collected by all cooperating states in further characterizing available breeds and strains of cattle. Accumulated data from Front Royal

indicate that Angus calves are dropped 9.5 days earlier than Herefords and Shorthorns, and that inbreds calve 4.5 days later than non-inbreds. Four states are investigating genetic-environmental interactions. Jeanerette reported slightly heavier weaning weights for calves sired by local bulls than for those by bulls raised outside the area. Groups of Hereford cattle originating in Montana and Florida are being compared at both locations. Origin X location interactions are suggested for birth, weaning, and yearling weights but not for postweaning gain of bulls or 5-year-old cow weights. Cattle originating in Montana weaned calves weighing 33 pounds more than Florida cattle at the Montana location and 40 pounds less at the Florida location.

Texas and Florida were unsuccessful in attempts to differentiate between cattle exhibiting several anomalies and normal cattle on the basis of biochemical and cytological properties.

4. USEFULNESS OF FINDINGS:

Current information is continually made available to beef producers by the cooperating state institutions and the United States Department of Agriculture. Industry interest is very evident in the areas of selection for increased rate of gain, crossbreeding and genetic-environmental interactions. Of equal importance, member institutions of S-10 use regional information in designing studies which are complementary rather than competitive with other work in the area. Hence, producers obtain a more efficient overall research effort.

5. WORK PLANNED FOR NEXT YEAR:

Investigations will proceed according to project outlines. A number of contributing projects initiated in 1968 will investigate correlated responses of various traits to selection for growth. These studies were so designed that certain of the data should be suitable for pooling.

6. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR:

See attached list.

7. APPROVED:

_____ _____

Date Chairman, Technical Committee

_____ _____

Date Regional Administrative Advisor

TABLE 1. Cattle Inventory and Percent Used in S-10 Contributing Projects July 1, 1968

State	Cows two years and over	Yearling Heifers	Bulls and steers under one yr.	Heifers under one yr.	Bulls over one yr.	Steers over one yr.	Total No.	Per-Cent Used
Alabama	286	38	128	128	20	-	600	100
Arkansas	389	87	147	113	74	-	810	100
Florida	3335	1040	601	653	228	181	6038	91
Georgia	698	253	325	289	31	50	1646	96
Kentucky	316	40	74	87	42	-	559	100
Louisiana	358	111	137	144	12	-	762	100
Mississippi	462	85	-	-	30	36	613	100
North Carolina	186	54	65	69	37	-	411	100
South Carolina	193	54	63	64	15	-	389	100
Tennessee	296	60	114	118	96	-	684	100
Texas	479	90	156	180	51	14	970	100
Virginia	471	-	-	-	36	-	507	98
Subtotal	7469	1912	1810	1845	672	281	13989	
Federal-State Cooperative Station:								
Brooksville, Florida	460	169	111	100	156	32	1028	100
Jeanerette, Louisiana	304	99	102	91	45	-	641	100
Front Royal, Virginia	498	144	173	160	52	-	1027	100
Subtotal	1262	412	386	351	253	32	2696	
Total	8731	2324	2196	2196	925	313	16685	

TABLE 2. Numbers of Animals Performance Tested and Slaughtered from S-10 Contributing Project in 1967-68

State	Performance Tested			Slaughtered		
	Bulls	Heifers	Steers	Bulls	Heifers	Steers
Alabama	66	115	50	-	-	50
Arkansas	101	78	-	31	-	-
Florida	102	661	118	-	-	118
Georgia	54	160	110	11	14	60
Kentucky	73	122	36	63	44	36
Louisiana	-	-	135	-	-	129
Mississippi	-	-	36	-	-	-
North Carolina	63	54	74	24	-	74
South Carolina	20	54	49	8	-	49
Tennessee	101	125	-	-	-	-
Texas	49	159	73	-	1	6
Virginia	-	-	-	-	-	-
Subtotal	629	1528	681	137	59	522
Brooksville, Florida	116	133	-	-	36	32
Jeanerette, Louisiana	47	-	-	25	-	-
Front Royal, Virginia	71	145	-	-	-	-
Subtotal	234	278	-	25	36	32
Total	863	1806	681	162	95	554

TABLE 3. Funds Expended on Beef Cattle Breeding Research in S-10 Herds During the Fiscal Year Ending June 30, 1968

State	Regional Research Funds	AHRD Funds	State-Controlled Funds	Income from Cattle
Alabama	25,498.00	- 0 -	48,000.00	44,441.00
Arkansas	15,600.00	- 0 -	90,000.00	46,400.00
Florida	- 0 -	- 0 -	76,979.15	77,976.24
Georgia				
Kentucky	29,170.00	- 0 -	10,074.00	35,078.00
Louisiana	22,945.00	- 0 -	90,071.00	68,243.00
Mississippi	10,900.00	- 0 -	19,000.00	11,000.00
North Carolina	11,000.00	- 0 -	40,700.00	22,000.00
South Carolina	28,340.00	- 0 -	11,084.00	31,410.00
Tennessee	10,000.00	10,500.00	50,800.00	42,451.31
Texas	29,684.00	21,400.00	170,736.00	70,950.00
Virginia	27,500.00	6,100.00	58,500.00	21,000.00
Brooksville, Florida	- 0 -	69,355.00	85,548.00	85,548.69
Jeanerette, Louisiana	- 0 -	47,508.01	117,487.78	38,972.38
Front Royal, Virginia	- 0 -	68,784.00	123,070.00	51,643.00

STATE REPORTS

AUBURN UNIVERSITY

Agricultural Experiment Station

I. PROJECT: Hatch 219 (S-10)

The Effect of Environment, Genetic-Environmental Interaction and Heterosis on Performance of Beef Cattle.

II. OBJECTIVES:

To evaluate the effect of environment and genetic progress under phenotypic selection.

To determine the effectiveness of selection for total performance in beef cattle.

To determine the influence of heterosis on rate of gain carcass quality and cow performance.

III. PERSONNEL:

T. B. Patterson and G. B. Meadows

IV. ACCOMPLISHMENTS DURING THE YEAR:

1. Scope and nature of work.

The purebred Angus and Hereford herds have been divided into similar groups based on ancestry and previous record. Line I Angus and Hereford herds have been designated as the high nutritional groups while Line II Angus and Hereford herds have been designated as the low nutritional herds. Selection by index for replacements will be on a within group basis.

The crossbreeding study is in the final phase with the last calf crop on the ground.

2. Research results.

Data for the first full year have been completed through post-weaning performance. These data are summarized in Table 1.

TABLE 1. SUMMARY PERFORMANCE OF 1966-67 CALF CROP GENETIC-ENVIRONMENTAL INTERACTION.

Nutritional group	I (High)				II (Low)			
Breed	Angus		Hereford		Angus		Hereford	
Sex	Bulls	Heifers	Bulls	Heifers	Bulls	Heifers	Bulls	Heifers
No. of calves	18	14	20	13	10	20	18	17
Av. adjusted weaned wt. lbs.	565	558	503	501	469	490	444	477
Av. conformation score 1/	13.1	12.7	13.0	12.5	12.7	12.6	12.6	12.5
Av. finish score 2/	4.9	5.1	4.2	4.2	3.6	4.6	3.5	4.1
Av. daily gain post-weaned test, lbs.	2.40	1.23	2.50	0.98	2.66	1.17	2.53	0.97
Av. wt/day age end of test, lbs.	2.29	1.62	2.18	1.42	2.16	1.46	1.99	1.39

1/ 12 - low choice; 13 choice

2/ 2 - thin, 5 med 8-fat

Angus calves that were creep fed averaged 79 lb. heavier at weaning than non-creeped calves. This average difference was 42 lb. for Hereford calves. Sixty-two Angus calves averaged 524 lbs. while 68 Hereford calves averaged 480 lb., a difference of 44 lb. The only indication of compensatory gain on post-weaning test was for Angus bulls. The non-creeped bulls gained 0.26 lb. per day faster than did bulls that had been creep fed. There were smaller non-significant differences in degree of finish at weaning and at the end of test that favored the creeped calves. No differences in average conformation scores were observed.

One Angus bull and one Hereford bull were selected by index from each of the two nutritional groups. Heifer replacements were selected by index on a within group basis.

The last group of crossbred calves in phase two of the crossbreeding study have been born. A summary of the performance of the two groups of crossbred calves from birth to weaning is presented in Table 2.

TABLE 2. SUMMARY - TWO BREED VS. THREE BREED CROSS CALVES FROM BIRTH TO WEANING - SIX YEARS

	Two Breed Crosses	Three Breed Crosses	Difference
No. of calves	160	205	
Av. birth wt., lb.	64.4	66.3	1.9
Av. adj. weaned wt., lb.	470.1	488.7	18.6
Av. slaughter score 1/	9.8	10.0	0.2

1/ 10 - Good; 13 - Choice

These differences have been of approximately the same magnitude and favoring the three-breed cross calves in each of the six years.

A six year summary of the post-weaning performance for the heifers is shown in Table 3.

TABLE 3. SUMMARY - TWO BREED VS. THREE BREED CROSS HEIFERS POST-WEANING - SIX YEARS

	Two Breed Crosses	Three Breed Crosses	Differences
No. of heifers	91	95	
Av. gain on test 120 days, lb.	191.1	189.8	-1.3
Av. final wt., lb.	668.0	681.8	13.8
Av. wt./day age, lb.	1.52	1.56	0.4
Av. final breeder score 1/	12.3	12.4	0.1

1/ 10 - Good; 13- Choice

The difference of 14 lb. in favor of the three-breed crosses is a reflection of difference in weaned wt. Since the two breed crosses gained slightly faster post-weaning than the three breed crosses, it is likely that had the post-weaning period been longer all differences would have disappeared.

A five year summary of the post-weaning performance and carcass data for the steers is presented in Table. 4.

Table 4. SUMMARY - TWO BREED VS. THREE BREED CROSS STEERS POST-WEANING AND CARCASS DATA, FIVE YEARS

	Two Breed Crosses	Three Breed Crosses	Difference
No. of steers	58	93	
Av. final wt. shrunk lb.	993.6	994.9	1.3
Av. no. days on feed, days	291.0	297.8	6.8
Av. daily gain on feed, lb.	1.89	1.80	-0.09
Av. carcass grade 1/	13.9	14.1	0.2
Av. adjusted rib-eye area/cwt., sq.in.	1.95	1.95	0.0
Av. fat thickness, in.	0.71	0.77	0.06
Av. W. B. shear, lb./sq.in 2/	15.20	14.30	-0.90

1/ 13 - Choice

2/ 10-14 Very Tender; 15-19 Moderately tender

The small difference in average daily gain favoring the two breed cross steers in the feed lot has been consistant and expected compensatory gain. No other differences existed for any recorded trait.

V. FUTURE PLANS:

The project will be continued on the present basis.

VI. PUBLICATIONS DURING THE YEAR:

Summary Beef Cattle Performance Test

VII. PUBLICATIONS PLANNED:

None

Submitted by: Troy B. Patterson

I. PROJECT: Animal Science 4-016

A Comparison of Crossbreeding and Within Breed Selection on Beef Cattle Production in the Black Belt Area of Alabama.

II. OBJECTIVES:

To evaluate the significance of hybrid vigor in various crosses of beef cattle with regard to production of slaughter calves, stocker or feeder steers and slaughter steers.

To determine the effect of heterosis on mothering ability adaptability and fertility.

III. PERSONNEL:

T. B. Patterson, L. A. Smith and Harold Grimes.

IV. ACCOMPLISHMENTS DURING THE YEAR:

1. Scope and nature of work.

Seventy brood cows of Hereford, Angus-Hereford and Hereford-Brahman breeding are used in this project. Data collected include weaned weights and grades on all calves and post weaning performance and carcass information on all steer calves.

2. Research results.

The final set of calves have been weaned, fed out and slaughtered. A summary of the seven years from birth to weaning is shown on table 1.

Table 1. SUMMARY OF CROSSBREEDING FROM BIRTH TO WEANING - SEVEN YEARS

	Hereford Control	3/4 Hereford 1/4 Angus	3/4 Angus 1/4 Here.	7/8 Hereford 1/8 Brahman
No. of calves	105	76	66	135
Adj. weaned wt., lb.	461.1	521.4	510.5	485.4
Slaughter grade 1/	9.9	11.0	10.8	9.9
Stocker grade 1/	11.9	12.4	12.3	11.4
Percent calf crop weaned	88.7	93.8	86.8	87.9

1/ 9 - Low Good; 10 - Good; 11 High Good; 12 Low Choice

Compared to the Hereford control the differences at weaning are 60, 50 and 24 lb. respectively in favor of the 3/4 Hereford, 1/4 Angus, 3/4 Angus 1/4 Hereford and 7/8 Hereford 1/8 Brahman calves. The small differences in grade were not significant. A significantly higher percent calf crop was obtained when a Hereford bull was bred to 1/2 Hereford 1/2 Angus cows than was obtained from the other groups.

A summary of the post weaning performance of the steer calves is shown in Table 2.

Table 2. SUMMARY CROSSBREEDING - PASTURE AND FEED LOT PERFORMANCE SEVEN YEARS

	Breed Composition of Steers			
	Hereford Control	3/4 Hereford 1/4 Angus	3/4 Angus 1/4 Hereford	7/8 Hereford 1/8 Brahman
No. of steers	47	30	19	60
No. days on pasture	82	78	90	85
Initial wt., lb.	488	558	552	528
Av. daily gain on pasture, lb.	1.73	1.56	1.47	1.72
Av. final wt., lb.	630	680	684	674
Cost per cwt. gain, $	$ 14.95	$ 17.00	$ 18.48	$ 14.55
Days on Feed	144	144	144	144
Av. daily gain, lb.	2.38	2.26	2.29	2.21
Cost per cwt. gain, $	$ 23.47	$ 26.29	$ 26.21	$ 25.27
Av. final shrunk wt., lb.	973	1006	1016	992

Largely as a result of compensatory gain the Hereford controls and the 7/8 Hereford 1.8 Brahman steers gain faster on pasture than did the other two groups of steers. Cost per cwt. gain was lower, as expected for the faster gaining steers. The Hereford controls continued to gain faster in the feed lot. However, at the end of the 144 days in the feed lot the 3/4 Hereford 1/4 Angus, 3/4 Angus 1/4 Hereford and the 7/8 Hereford 1/8 Brahman steers were respectively 23, 33 and 19 lbs. heavier than the Hereford control steers.

The carcass data, Table 3, shows little differences between the four groups of steers with the exception of the 3/4 Angus 1/4 Hereford.

Table 3. SUMMARY CROSSBREEDING CARCASS DATA SEVEN YEARS

	Breed Composition of Steers			
	Hereford Control	3/4 Hereford 1/4 Angus	3/4 Angus 1/4 Hereford	7/8 Hereford 1/8 Brahman
No. of steers	47	30	19	60
Av. Final shrunk wt., lb.	973	1006	1016	992
Carcass grade, federal 1/	11.2	11.6	12.5	10.8
Fat thickness, in.	0.44	0.49	0.67	0.48
Rib-eye area/cwt, sq. in.	2.03	2.08	2.07	2.09
Yield grade	2.97	2.77	3.22	2.83

1/ 9 - Low good; 10 - Good; 11 High Good; 12 - Low Choice

These steers were fatter and as a result, graded 1/3 grade and had a higher yield grade.

V. FUTURE PLANS:

This project has been revised.

VI. PUBLICATIONS DURING THE YEAR:

None

VII. PUBLICATIONS PLANNED:

Crossbreeding Beef Cattle in the Black Belt Area of Alabama.

Production, Inventory, and Performance Data, S-10 Herds - 1967-1968

State Alabama

Location		Auburn	Auburn	Auburn	Auburn	Auburn
Breed of Sire		Angus	Angus	Hereford	Hereford	Angus
Breed of Dam		Angus	Angus	Hereford	Hereford	Hereford
Line or Group[1]		High	Low	High	Low	Crossbreds
Percent used in project		100 %	100 %	100 %	100 %	100%
Inventory as of July 1, 1968	Cows 2 years and over	46	46	44	43	7
	Yearling heifers	7	9	9	13	0
	Bulls & Steers under 1 year	19	13	19	20	3
	Heifers under 1 year	22	28	13	15	4
	Bulls over 1 year	2	2	2	2	1
	Steers over 1 year	0	0	0	0	0
Repro. Perf.	Percent pregnant[2]	84.3	79.2	78.7	76.0	77.8
	Calf survival percent[3]	95.3	93.2	91.4	89.7	100.0
Wean. Perf.	Adj. ADG[4]	2.01	1.70	1.66	1.56	1.78
	Av. type sc.[5]	12.4	12.0	12.5	11.9	12.0
Postweaning Performance	No. of bulls	18	11	20	17	0
	No. of heifers	14	19	13	18	4
	No. of steers	0	0	0	0	0
Slaughtered	No. of bulls	0	0	0	0	0
	No. of heifers	0	0	0	0	0
	No. of steers	0	0	0	0	0
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves dead and alive. If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments: Mature dam, steer equivalent, 250 days.
5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory and Performance Data, S-10 Herds - 1967-68

State Alabama

Location		Auburn	Auburn	Auburn	Auburn	Auburn
Breed of Sire		Angus	Angus	Angus	Hereford	Hereford
Breed of Dam		Shorthorn	Hereford X Shorthorn	Shorthorn X Hereford	Angus	Shorthorn
Line or Group[1]		Cross-breds	Cross-breds	Cross-Breds	Cross-breds	Cross-breds
Percent used in project		100%	100%	100%	100%	100%
Inventory as of July 1, 1968	Cows 2 years and over	8	12	8	7	8
	Yearling heifers	0	0	0	0	0
	Bulls & Steers under 1 year	4	6	3	4	3
	Heifers under 1 year	4	6	5	3	5
	Bulls over 1 year	1	1	1	1	1
	Steers over 1 year	0	0	0	0	0
Repro. Perf.	Percent pregnant[2]	100%	100%	75%	77.8%	88.9%
	Calf survival percent[3]	100%	100%	88.9%	100%	100%
Wean. Perf.	Adj. ADG[4]	1.75	1.62	1.88	1.90	1.81
	Av. type sc.[5]	12.0	11.6	12.5	12.5	12.8
Postweaning Performance	No. of bulls	0	0	0	0	0
	No. of heifers	3	6	5	4	4
	No. of steers	0	4	1	5	2
Slaughtered	No. of bulls	0	0	0	0	0
	No. of heifers	0	0	0	0	0
	No. of steers	0	4	1	5	2
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments.
5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1967-68

State Alabama

Location		Auburn	Auburn	Auburn	Auburn	Auburn	Auburn
Breed of Sire		Hereford	Hereford	Shorthorn	Shorthorn	Shorthorn	Shorthorn
Breed of Dam		Angus X Shorthorn	Shorthorn X Angus	Angus	Hereford	Angus X Hereford	Hereford X Angus
Line or Group[1]		Cross-breds	Cross-breds	Cross-breds	Cross-breds	Cross-breds	Cross-breds
Percent used in project		100%	100%	100%	100%	100%	100%
Inventory as of July 1, 1968	Cows 2 years and over	9	11	8	9	6	14
	Yearling heifers	0	0	0	0	0	0
	Bulls & Steers under 1 year	5	5	4	7	5	8
	Heifers under 1 year	4	6	4	2	1	6
	Bulls over 1 year	1	1	1	1	1	1
	Steers over 1 year	0	0	0	0	0	0
Repro. Perf.	Percent pregnant[2]	90%	91.7%	100%	100%	54.5%	100%
	Calf survival percent[3]	100%	100%	88.9%	100%	100%	100%
Wean. Perf.	Adj. ADG[4]	1.90	1.93	1.60	1.60	1.83	1.93
	Av. type sc.[5]	12.4	12.2	11.6	11.5	12.3	12.2
Postweaning Performance	No. of bulls	0	0	0	0	0	0
	No. of heifers	6	6	3	4	3	3
	No. of steers	3	3	2	2	3	3
Slaughtered	No. of bulls	0	0	0	0	0	0
	No. of heifers	0	0	0	0	0	0
	No. of steers	3	3	2	2	3	3
Remarks							

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:
5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1967-68

State Alabama

Location	Black Belt		Substation		
Breed of Sire	Hereford	Hereford	Hereford	Angus	
Breed of Dam	Hereford	Angus X Hereford	3/4 Here. 1/4 Brahm.	Angus X Hereford	
Line or Group[1]	--Crossbreeding--				
Percent used in project	100%	100%	100%	100%	
Inventory as of July 1, 1968: Cows 2 years and over *	0	0	0	0	
Yearling heifers	0	0	0	0	
Bulls & steers under 1 year	0	0	0	0	
Heifers under 1 year	0	0	0	0	
Bulls over 1 year	0	0	0	0	
Steers over 1 year	0	0	0	0	
Repro. Perf.: Percent pregnant[2] **	93.3	93.8	88.9	87.5	
Calf survival percent[3]	100	100	87.5	90.5	
Wean. Perf.: Adj. ADG[4]	1.68	1.87	1.83	1.71	
Av. type sc.[5]	12.6	13.2	13.1	12.0	
Postweaning Performance: No. of bulls	0	0	0	0	
No. of heifers	0	0	0	0	
No. of steers	4	6	0	12	
Slaughtered: No. of bulls	0	0	0	0	
No. of heifers	0	0	0	0	
No. of steers	4	6	0	12	

Remarks * Project Completed
** Last calf crop - weaned 1967

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:
5 - Suggest S-10 scoring system; indicate if different.

UNIVERSITY OF ARKANSAS
Agricultural Experiment Station
Fayetteville, Arkansas

I. PROJECT:

Improvement of Beef Cattle for the Southern Region Through Breeding Methods - Arkansas Hatch 170 - Evaluation of Performance Records of Beef Cattle

II. OBJECTIVES:

Continue to develop practical but adequate methods for identifying, evaluating, and propagating the genetic potential for the production of beef.

III. PERSONNEL:

Brown, C. J., R. S. Honea, and F. Scaramuzza

IV. ACCOMPLISHMENTS DURING THE YEAR:

From purebred mating of Angus, Hereford, and Polled Hereford matings data have been collected in accordance with the long-range aspects of the project. These data include routine weights and measurements of cows and calves, postweaning performance test information on bulls, and carcass and eating quality data obtained on bulls that were slaughtered. The number and scope of these efforts are indicated in the accompanying inventory sheets. Crossbred matings to produce eight different genetic groups of cattle were made and the calves are being grown out for further studies. A companion State project under which 160 bulls were individually fed at three locations in the State was continued and summary completed.

A series of analyses dealing with the maternal and other influences on birth and 120-day weight were completed and prepared for publication. These are summarized in Table 1. In order to compute values for the theoretical components of variance and covariance, it was necessary to make the assumption that variance due to dominance effects for the maternal influence and the covariance between dominance effects for maternal influences and growth were zero. The values presented in Table 1 suggest important additive effects for both growth and maternal influences on birth weight. These values also suggest an antagonism between growth and maternal influences for birth weight. Such an antagonism would tend to be a balanced mechanism that would maintain birth weights in an intermediate range. With high genetic correlations between growth rate in different periods such an antagonism at this point in the life cycle could impose limits on the improvement in growth rate in subsequent periods. During the primary suckling period as indicated by the 120-day weight these relationships appear to have changed in the Hereford herd but not in the Angus herd.

Variance due to dominance effects for growth appear to be small in both herds in both periods. Negative values for the variance due to permanent environment in three of the four values are intriguing since they would suggest unknown permanent environmental effects that tend to reduce variability in birth and 120-day weight.

V. FUTURE PLANS:

Continue observations and herd records.

VI. PUBLICATIONS DURING THE YEAR:

Brown, C. J., Victor Galvez, and R. S. Honea. 1968. Maternal and non-maternal factors influencing birth weight of beef calves. Ark. Animal Sci. Conf. pp 1-4.

Brown, C. J., 1968. Usefulness of the production index for beef bulls. Ark. Animal Sci. Res. Conf. pp. 29-32.

Scaramuzza, F., C. J. Brown, and R. S. Honea. 1968. Maternal influence on gain of beef calves to 120-days of age. Ark. Animal Sci. Conf. pp 5-8.

Scaramuzza, Frank L. 1968. Paternal and maternal effects on pre-weaning growth rate of beef calves. Master's Thesis, University of Arkansas Library.

Stallcup, O. T., C. J. Brown, and W. T. Cole. 1968. Lactic dehydrogenase and transaminases in bovine epididymal fluid. J. Reprod. Fert. 15: 317-319.

Wright, O. E. and C. J. Brown. 1968. Sire-son comparisons of production index for beef bulls. Ark. Animal Sci. Res. Conf. pp. 33-35.

Table 1. Computed Values for Theoretical Components of Variance and Covariance Expressed as a Percentage of Total Variance.

	Birth Weight		120-day Weight	
	H	A	H	A
Additive genetic variance for growth	83	39	74	84
Additive genetic variance for maternal effects	47	41	0	81
Covariance between additive values for growth and maternal effects	-41	-23	5	-61
Variance due to dominance effects[1] for maternal influences	---	---	---	---
Variance due to dominance effects for growth	17	9	0	0
Covariance between dominance effects[1] for growth and maternal effects	---	---	---	---
Variance due to permanent enviromental effects	-21	-21	7	-16
Variance due to non-permanent environmental effects	15	56	14	12

[1]Assumed to be zero in order to solve equations.

Production, Inventory and Performance Data, S-10 Herds - 1967-68

State Arkansas

Location		MS	MS	MS	MS	MS
Breed of Sire		Angus	Hereford	P. Here.	(H.,A.,	Ch., SG)
Breed of Dam		Angus	Hereford	P. Here.	Angus	Hereford
Line or Group[1]		Purebred	Purebred	Purebred	Cross breed	Cross breed
Percent used in project		100	100	100	100	100
Inventory as of July 1, 1968	Cows 2 years and over	187	55	64	40	43
	Yearling heifers	39	21	18	9	0
	Bulls & Steers under 1 year	77	23	25	14	8
	Heifers under 1 year	61	15	14	10	13
	Bulls over 1 year	49	11	14	0	0
	Steers over 1 year	0	0	0	0	0
Repro. Perf.	Percent Pregnant[2]	82	82	82	85	73
	Calf survival percent	91	94	94	95	90
Wean. Perf.	Adj. ADG[4]	1.69	1.56	1.79	(6)	(6)
	Av. type sc.[5]	12.0	12.5	13.0		
Postweaning Performance	No. of bulls	61	16	24		
	No. of heifers	39	21	18		
	No. of steers	0	0	0		
Slaughtered	No. of bulls	18	4	9		
	No. of heifers	0	0	0		
	No. of steers	0	0	0		
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cwos that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments: AHIR, TPR AND Guidelines adjustments.
5 - Suggest S-10 scoring system; indicate if different.
6 - Growth data on these calves included with purebreds since these were all purebred calves on cows at time of assignment.

UNIVERSITY OF FLORIDA
Agricultural Experiment Station
Gainesville, Florida

I. PROJECT: 627 (Revised)

Pasture programs and cattle breeding systems for beef production on flatwoods soils of Northcentral Florida.

II. OBJECTIVES:

1. To determine the relative cost of three pasture programs for beef production with a cow-calf operation.

2. To compare the effectiveness of four different breeding systems in improving the production of beef cattle.

3. To evaluate systems for growing heavy calves to market weight and grade.

III. PERSONNEL:

M. Koger, W. G. Blue, G. B. Killinger, J. M. Myers and R. E. L. Greene

IV. ACCOMPLISHMENTS DURING THE YEAR:

Two hundred ten females of breeding age were used during 1966-67 in evaluating four breeding programs which were initiated in 1957 with a foundation of Brahman-Native females:

1. Upgrading to British sire (Angus and Hereford)

2. Crisscrossing Angus and Hereford

3. Crisscrossing Angus and Brahman

4. Crisscrossing Hereford and Santa Gertrudis

Weaning data from the 1967 calf crop are presented in form S-10-1

V. FUTURE PLANS:

Present procedures will be continued until blood composition becomes stable enough to evaluate the programs. The data from feeding steers produced in the four programs will be summarized for presentation.

VI. PUBLICATIONS DURING THE YEAR:

None

VII. PUBLICATIONS PLANNED:

Station bulletin summarizing data from 1960-1964 in press.

EVERGLADES EXPERIMENT STATION
Belle Glade, Florida

I. PROJECT: 922

Angus, Brangus and Angus x Brangus crossbreds for beef production in the Everglades area.

II. OBJECTIVES:

1. To compare the performance of straightbred Angus and Brangus cattle with rotation crosses of the two breeds for beef production in the Everglades area.

2. To develop a highly productive herd of cattle at the Glades Correctional Institution through selection based on production testing.

III. PERSONNEL:

J. R. Crockett, D. W. Beardsley and M. Koger

IV. ACCOMPLISHMENTS DURING THE YEAR:

These were 1555 females of breeding age in the project. Blood composition has not stabilized to the point that performance of different breed groups can be evaluated.

V. FUTURE PLANS:

Increased selection pressure is to be initiated in order to speed up stabilization of blood composition of different breed groups.

VI. PUBLICATIONS:

None

VII. PUBLICATIONS PLANNED:

None

EVERGLADES EXPERIMENT STATION
Belle Glade, Florida

I. PROJECT: 990

Breeding beef cattle for adaptation to South Florida conditions.

II. OBJECTIVES:

1. To compare the performance of progeny of Angus, Brahman and Hereford cattle, and from three possible two-breed rotational crosses of these breeds for beef production in the South Florida area.

2. To develop through selection, Angus and Hereford cattle which will be adapted to South Florida conditions.

III. PERSONNEL:

J. R. Crockett, D. W. Beardsley and M. Koger

IV. ACCOMPLISHMENTS DURING THE YEAR:

There were 458 females of breeding age in the project. Data from this project are shown in form S-10-1.

V. FUTURE PLANS:

Continue project as outlined. Study grazing habits and forage intake of the different breed groups.

VI. PUBLICATIONS:

None

VII. PUBLICATIONS PLANNED:

Preliminary results from crossbreeding Angus, Brahman and Hereford cattle.

UNIVERSITY OF FLORIDA
Agricultural Experiment Station
Gainesville, Florida

I. PROJECT: 1003

Inherent body size in cattle as related to adaptation to Florida's climatic environment.

II. OBJECTIVES:

To determine the performance of three different groups of beef cattle selected respectively for:

1. Large skeletal and body size

2. Adaptation to Florida climate as reflected in thrift and vitality, and

3. The combination of weight and grade to give the greatest economic returns per animal unit.

III. PERSONNEL:

M. Koger, F. S. Baker and A. C. Warnick

IV. ACCOMPLISHMENTS DURING THE YEAR:

Three groups of 250 cows each are being used in a selection experiment. One group is being selected for large skeletal size to determine the effect this trait has on adaptability to Florida. Another group is being selected for indications of adaptability, measured mainly by condition score to determine whether animals selected for this trait tend toward any particular size. The third group serves as a control. The project has not been under way long enough for the groups to become distinct.

V. FUTURE PLANS:

Continue project as outlined.

VI. PUBLICATIONS DURING THE YEAR:

None

VII. PUBLICATIONS PLANNED:

None

RANGE CATTLE EXPERIMENT STATION
Ona, Florida

I. PROJECT: 1120

Charolais, Brahman, Angus and their crosses for beef production in South Florida.

II. OBJECTIVES:

To evaluate the relative productivity of Charolais, Brahman, Angus and their crosses for beef production in South Florida.

III. PERSONNEL:

F. M. Peacock, E. M. Hodges, H. L. Chapman and M. Koger

IV. ACCOMPLISHMENTS DURING THE YEAR:

Angus, Brahman and Charolais bulls are being mated to females of the same breeds in all possible combinations to produce straightbred and crossbred progeny. The three groups of F_1 females likewise will be mated to the three breeds of bulls to produce backcross and three-breed cross progeny. A minimum of 90 straightbred females (10 per subgroup) are bred each year. A comparable number of crossbred females will be added to the project as they are produced. The post-weaning and feedlot performance of progeny produced in the trial are evaluated in a companion study. The second calf crop was weaned in 1965. The data are summarized in form S-10-1.

V. FUTURE PLANS:

Continue project as outlined.

VI. PUBLICATIONS DURING THE YEAR:

None

VII. PUBLICATIONS PLANNED:

None

NORTH FLORIDA EXPERIMENT STATION
Quincy, Florida

I. PROJECT: 1180

Selection of replacement females in beef cattle.

II. OBJECTIVES:

To compare genetic progress and economic returns from selecting replacements on their own calfhood performance versus selection on the basis of production records.

III. PERSONNEL:

F. S. Baker, Jr. and M. Koger

IV. ACCOMPLISHMENTS DURING THE YEAR:

The 1967 calf crop represented the second year's production following the initiation of the selection procedures outlined for females. The weaning data from the 1967 calf crop is summarized in form S-10-1.

V. FUTURE PLANS:

Continue project as outlined.

VI. PUBLICATIONS DURING THE YEAR:

None

VII. PUBLICATIONS PLANNED:

None

EVERGLADES EXPERIMENT STATION
Belle Glade, Florida
(Project located at Brighton Seminole Indian Reservation)

I. PROJECT: 1263

Selection for maternal ability in beef cattle.

II. OBJECTIVES:

1. To compare maternal ability and individual excellence in weight and grade at 20 months of age as selection criteria in improvement of beef cattle.

2. To produce herd sires from adapted Hereford cattle for use in tribal herds.

III. ACCOMPLISHMENTS DURING THE YEAR:

These were 291 breeding age females in the project. Appropriate data are shown in form S-10-1.

IV. FUTURE PLANS:

Continue project as outlined.

V. PUBLICATIONS DURING THE YEAR:

None

VI. PUBLICATIONS PLANNED:

None

Production, Inventory, and Performance Data, S-10 Herds 1967-68

State Florida

Location		Gainesville	Gainesville	Gainesville	Gainesville	
Breed of Sire		A. H.	A.H.	A.B.	H,SG	
Breed of Dam		grades	crossbred	crossbred	crossbred	
Line or Group[1]		straightbreds	AH crisscross	AB crisscross	HSG crisscross	
Percent used in project		50	50	50	50	
Inventory as of July 1, 1968	Cows 2 years and over	60	59	55	53	
	Yearling heifers	17	15	16	15	
	Bulls & Steers under 1 year	12	25	17	20	
	Heifers under 1 year	24	21	31	15	
	Bulls over 1 year	4	2	2	2	
	Steers over 1 year	0	0	0	0	
Repro. Perf.	Percent pregnant[2]	92	98	94	94	
	Calf survival percent[3]	97	90	95	95	
Wean. Perf.	Adj. ADG[4]	1.96	1.97	1.99	2.13	
	Av. type sc.[5]	12.3	12.3	11.8	12.1	
Postweaning Performance	No. of bulls	0	0	0	0	
	No. of heifers	17	15	16	15	
	No. of steers	21	23	12	25	
Slaughtered	No. of bulls	0	0	0	0	
	No. of heifers	0	0	0	0	
	No. of steers	21	23	12	25	
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:
5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds 1967-68

State Florida

Location		Quincy	Quincy	Raiford	Belle Glade	Brighton
Breed of Sire		Angus	Angus	Angus	Angus Brangus	Hereford
Breed of Dam		Angus	Angus	Gr. Angus	A, By, AxBy	Grade H
Line or Group[1]		Control	Maternal ability	Combined[a]	Combined[a]	Combined[a]
Percent used in project		50	50	100[b]	100[b]	100[b]
Inventory as of July 1, 1968	Cows 2 years and over	45	49	798	1555	291
	Yearling heifers	21	17	297	464	69
	Bulls & Steers under 1 year	17	16		319	92
	Heifers under 1 year	15	15		338	102
	Bulls over 1 year	11	16	29	70	75
	Steers over 1 year	0	0	0	0	0
Repro. Perf.	Percent pregnant[2]	91	84	83.3	86	68
	Calf survival percent[3]	91	100	90.8	91	76
Wean. Perf.	Adj. ADG[4]	1.99	1.93	1.68	1.62	1.73
	Av. type sc.[5]	11.3	11.1	10.3	9.2	11.2
Postweaning Performance	No. of bulls	11	16	0		75
	No. of heifers	21	17	297		69
	No. of steers	0	0	0		0
Slaughtered	No. of bulls	0	0	0	0	0
	No. of heifers	0	0	0	0	0
	No. of steers	0	0	0	0	0
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:
5 - Suggest S-10 scoring system; indicate if different

a. New projects, groups combined b. Cattle owned by cooperator

Production, Inventory, and Performance Data, S-10 Herds 1967-68

State Florida

Location		Belle Glade	Belle Glade	Belle Glade		
Breed of Sire		Angus	Brahman	Hereford		
Breed of Dam		Angus	Brahman	Hereford		
Line or Group[1]		Angus	Brahman	Hereford		
Percent used in project		75	75	75		
Inventory as of July 1, 1968	Cows 2 years and over	47	49	58		
	Yearling heifers	16	12	16		
	Bulls & Steers under 1 year	15	10	18		
	Heifers under 1 year	12	18	15		
	Bulls over 1 year	14	15	6		
	Steers over 1 year	9	10	36		
Repro. Perf.	Percent pregnant[2]	97	74	98		
	Calf survival percent[3]	78	74	97		
Wean. Perf.	Adj. ADG[4]	1.64	1.90	1.69		
	Av. type sc.[5]	11.7	11.2	11.3		
Postweaning Performance	No. of bulls					
	No. of heifers	16	12	16		
	No. of steers					
Slaughtered	No. of bulls					
	No. of heifers					
	No. of steers					
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:
5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds 1967-68

State Florida

Location		Belle Glade	Belle Glade	Belle Glade	Range Cat. Sta.	Range Cat. Sta.
Breed of Sire		A.B.	A.H.	B.H.	Angus (A)	Brahman (B)
Breed of Dam		Criss-cross	Criss-cross		A	B
Line or Group[1]		AB criss-cross	AH criss-cross	BH criss-cross	Purebred	Purebred
Percent used in project		75	75	75	100	100
Inventory as of July 1, 1968	Cows 2 years and over	100	102	102	37	39
	Yearling heifers	34	30	29	7	6
	Bulls & Steers under 1 year	26	31	32	5	4
	Heifers under 1 year	31	27	34	5	7
	Bulls over 1 year	0	0	0	3	3
	Steers over 1 year	52	62	72	0	0
Repro. Perf.	Percent pregnant[2]	95	89	82	92	100
	Calf survival percent[3]	91	85	96	100	100
Wean. Perf.	Adj. ADG[4]	1.95	1.67	2.05	1.38	1.69
	Av. type sc.[5]	11.9	11.8	11.8	9.7	9.1
Postweaning Performance	No. of bulls				0	0
	No. of heifers	34	30	29	7	6
	No. of steers				7	4
Slaughtered	No. of bulls					
	No. of heifers					
	No. of steers				7	4
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:
5 - Suggest S-10 scoring system; indicate if different.

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Production, Inventory, and Performance Data, S-10 Herds 1967-68

State Florida

Location		Range Cat. Sta.	Range Cat. Sta.	Range Cat. Sta.	Range Cat. Sta.	
Breed of Sire		Charo-lais (C)	A,B	A,C	B,C	
Breed of Dam		C	B,A	C,A	C,B	
Line or Group[1]		Purebred	Reciprocal crossbred	Reciprocal crossbred	Reciprocal crossbred	
Percent used in project		100	100	100	100	
Inventory as of July 1, 1968	Cows 2 years and over	46	27	19	19	
	Yearling heifers	7	8	12	17	
	Bulls & Steers under 1 year	2	8	6	12	
	Heifers under 1 year	10	8	14	6	
	Bulls over 1 year	3	0	0	0	
	Steers over 1 year	0	0	0	0	
Repro. Perf.	Percent pregnant[2]	93	74	89	81	
	Calf survival percent[3]	100	93	89	95	
Wean. Perf.	Adj. ADG[4]	2.11	1.82	1.77	1.93	
	Av. type sc.[5]	10.3	10.2	10.6	10.2	
Postweaning Performance	No. of bulls	0	0	0	0	
	No. of heifers	7	8	12	17	
	No. of steers	7	5	12	2	
Slaughtered	No. of bulls					
	No. of heifers					
	No. of steers	7	5	12	2	
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:
5 - Suggest S-10 scoring system; indicate if different.

BROOKSVILLE BEEF CATTLE RESEARCH STATION
Brooksville, Florida

I. PROJECT: Work Unit No. 03-30-013-10-03 State Project 1186
-27-04

A study of response to selection and genetic-environmental interaction in genetically similar groups of Hereford cattle at two locations (Miles City, Montana and Brooksville, Florida).

II. OBJECTIVES:

1. To determine whether originally genetically similar groups of cattle bred and selected for several generations according to the same criteria in the two markedly different environmental conditions of Miles City, Montana and Brooksville, Florida become genetically different or remain similar.

2. To estimate the importance of genetic-environmental interaction within a British breed of beef cattle.

3. To determine the importance of adaptation to a specific location if maximum productivity is to be attained.

III. PERSONNEL:

Project committee composed of the following persons: Representatives of the Florida and Montana Agricultural Experiment Stations as designated by the respective directors: Superintendents of the Miles City and Brooksville stations, plus not more than one additional person from each station: the W-1 and S-10 Regional Coordinators: and the Chief of the Beef Cattle Research Branch, U. S. Department of Agriculture.

IV. ACCOMPLISHMENTS DURING THE YEAR:

(a) The seventh calf crop has been weaned.

(b) Means from accumulated data through 1967 are presented: (See next page.)

V. FUTURE PLANS:

Accumulated data will be summarized during 1969.

VI. PUBLICATIONS:

None.

VII. PUBLICATIONS PLANNED:

Summary of project to date.

G.E.I. PERFORMANCE
Data Collected Through 1967

Origin - Location	N	Birth Weight #	205-Day Weight #	N	Fall Yrlg. Wt./Day/Age #	Heifer Weight #	N	Bulls on Test ADG #	Test End Wt. #	N	5 yr. old Cow Wt. #
					Trait						
Mont.- Mont.	275	82.4	466	95	1.41	772	119	2.62	921	48	1150
Fla. - Mont.	124	74.2	433	57	1.27	710	49	2.44	873	14	1029
Mont.- Fla.	236	65.6	406	140	1.15	638	78	1.78	836	78	1107
Fla. - Fla.	166	65.7	446	62	1.16	675	58	1.64	850	24	993
Mont. minus Fla. in Mont.		8.2	33		0.14	62		0.18	48		121
Mont. minus Fla. in Fla.		-.1	-40		-.01	-37		0.14	-14		114
Mont. in Mont. minus Mont. in Fla.		16.8	60		0.26	134		0.84*	85*		43
Fla. in Mont. minus Fla. in Fla.		8.5	-13		0.11	35		0.80*	23*		36

* Feeding programs for bulls different at the two locations during 1966-67.

Production, Inventory, and Performance Data, S-10 Herds 1967-68

State Florida

Location		Brooks-ville	Brooks-ville	Brooks-ville	Brooks-ville	Brooks-ville
Breed of Sire		Angus	Angus	Brahman	Santa Gertrudis	Hereford
Breed of Dam		Angus	AB	Brahman	Santa Gertrudis	Hereford
Line or Group[1]		Purebreds	Cross-breds	Purebreds	Purebreds	line 5
Percent used in project		100	100	100	100	100
Inventory as of July 1, 1968	Cows 2 years and over	171	0	54	60	25
	Yearling heifers	52	36	10	21	7
	Bulls & Steers under 1 year	39	0	13	13	7
	Heifers under 1 year	25	0	11	10	8
	Bulls over 1 year	54	0	16	23	8
	Steers over 1 year	0	32	0	0	0
Repro. Perf.	Percent pregnant[2]	76	81	46	75	75
	Calf survival percent[3]	92	100	95.6	84	100
Wean. Perf.	Adj. ADG[4]	1.51	1.91	1.80	2.02	1.58
	Av. type sc.[5]	12.0	12.2	11.3	11.5	11.7
Postweaning Performance	No. of bulls	40	0	10	18	8
	No. of heifers	52	0	10	21	7
	No. of steers	0	0	0	0	0
Slaughtered	No. of bulls	0	0	0	0	0
	No. of heifers	0	36	0	0	0
	No. of steers	0	32	0	0	0
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:
5 - Suggest S-10 scoring system; indicate if different

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Production, Inventory, and Performance Data, S-10 Herds 1967-68

State Florida

Location		Brooks-ville	Brooks-ville			
Breed of Sire		Hereford	Hereford			
Breed of Dam		Hereford	Hereford			
Line or Group[1]		line 4	line 6			
Percent used in project		100	100			
Inventory as of July 1, 1968	Cows 2 years and over	90	60			
	Yearling heifers	27	16			
	Bulls & Steers under 1 year	20	19			
	Heifers under 1 year	28	18			
	Bulls over 1 year	31	24			
	Steers over 1 year	0	0			
Repro. Perf.	Percent pregnant[2]	65	84			
	Calf survival percent[3]	86	93			
Wean. Perf.	Adj. ADG[4]	1.56	1.73			
	Av. type sc.[5]	11.6	12.0			
Postweaning Performance	No. of bulls	22	18			
	No. of heifers	27	16			
	No. of steers	0	0			
Slaughtered	No. of bulls	0	0			
	No. of heifers	0	0			
	No. of steers	0	0			
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:
5 - Suggest S-10 scoring system; indicate if different.

GEORGIA COASTAL PLAIN EXPERIMENT STATION
Tifton, Georgia

I. PROJECT: Animal Husbandry 209, AHRD d1-3 (S-10)

A Study of Grading, Crisscrossing and Rotational Crossing as Breeding Systems for Commercial Beef Production.

II. OBJECTIVES:

To study the relative value of grading, crisscrossing and rotational crossing as breeding systems for commercial beef production.

To study heterotic effects in crosses between Angus and Polled Hereford breeds, as compated to heterosis in crosses between these breeds and Santa Gertrudis - a breed based partially on a Brahman foundation.

To study the comparative value of the Santa Gertrudis breed with the Angus and Polled Hereford breeds.

III. PERSONNEL:

Hollis D. Chapman, T. M. Clyburn and W. C. McCormick

IV. ACCOMPLISHMENTS DURING THE YEAR:

Weaning data for the 1967 calf crop raised by generation 1 cows are as shown in Table 1.

TABLE 1. Weaning data, 1967 calves, Generation 1 Cows

Herd	Breeding system	No. calves	Avg. birth wt.	A.D.G. birth to weaning	Avg. type score	Avg. condition score
Gr. A.	Grading-up	22	61	1.69	10.9	9.7
Gr. PH	Grading-up	24	66	1.48	9.6	8.8
Gr. SG	Grading-up	18	72	1.98	9.1	8.9
AxPH	Crisscrossing	31	64	1.65	9.8	9.1
AxSG	Crisscrossing	21	65	1.90	10.0	9.6
PHxSG	Crisscrossing	22	71	1.83	9.6	9.2
AxPHxSG	Rotational crossing	27	69	1.87	10.4	9.7

Weaning data for the 1967 calf crop raised by generation 2 animals are as shown in table 2.

TABLE 2. Weaning Data, 1967 Calves, Generation 2 Cows

Herd	Breeding system	No. calves	Avg. birth weight	A.D.G. birth to weaning	Avg. type score	Avg. condition score
Gr.A.	Grading-up	15	61	1.64	10.6	9.3
Gr.PH	Grading-up	18	64	1.49	9.8	8.8
Gr.SG	Grading-up	10	64	1.88	9.2	9.3
AxPH	Crisscrossing	20	58	1.63	10.0	9.1
AxSG	Crisscrossing	14	64	1.77	10.1	9.5
PHxSG	Crisscrossing	12	71	1.81	9.5	9.0
AxPHxSG	Rotational crossing	17	62	1.84	10.7	10.2

Sixty generation 2 steer calves selected from the 1966 calf crop were grazed and managed as a group until slaughtered in August and September, 1967. The data for these herds are shown in table 3.

TABLE 3. Growth and Carcass Data - Generation 2 Steers

	Live Animal Evaluation					
Herd	No. steers	Initial wt.	Final wt.	Daily gain	Wt./day of age	Slaughter grade
A	8	423	873	1.51	1.48	9.0
H	8	409	912	1.69	1.56	8.4
SG	8	478	985	1.72	1.73	8.4
AxH	8	435	939	1.66	1.57	9.1
AxSG	8	469	942	1.59	1.62	8.9
HxSG	8	445	962	1.74	1.71	9.1
AxHxSG	12	485	1003	1.72	1.73	9.3

	Carcass Evaluation						
Herd	Hot wt.	Dressing percent	Length	Grade	Rib eye/ cwt.	Rib eye fat in.	Wt./day of age
A	497	57.0	45.66	9.8	2.04	.51	.84
H	502	55.1	46.53	8.6	1.77	.54	.86
SG	564	57.2	48.09	9.0	1.79	.43	.99
AxH	529	56.3	47.06	9.5	1.82	.59	.88
AxSG	534	56.6	46.66	9.5	1.75	.48	.92
HxSG	539	56.1	46.75	9.5	1.87	.55	.95
AxHxSG	565	56.2	47.50	9.3	1.85	.49	.98

V. FUTURE PLANS:

The studies will be continued as planned.

VI. PUBLICATIONS DURING THE YEAR:

Routine annual reports.

VII. PUBLICATIONS PLANNED:

Data for generation 1 animals were completely analyzed and prepared for publication. Several reviewers suggested that data for generation 1 and generation 2 be combined in the same publication. Generation 2 data will be analyzed in the near future and results for both generations combined.

Submitted by: W. C. McCormick

I. PROJECT: State 2-99 (S-10)

Selection of Beef Cattle for Single Items of Importance in Profitable Beef Production.

II. OBJECTIVES:

To obtain preliminary information on the relative effectiveness of selecting for a single character.

To observe trends in characters for which no selection is made when selection is for a single character.

III. PERSONNEL:

Hollis D. Chapman, T. M. Clyburn and W. C. McCormick

IV. ACCOMPLISHMENTS DURING THE YEAR:

Four herds of grade Polled Hereford females, owned and maintained by the Georgia State Prison Farm, Reidsville, are used to study selecting for (1) weaning weight, (2) rate of postweaning gain, (3) type score and, (4) average performance. For the last group, replacements with records nearest average for each trait are selected. Bulls used in all four groups are selected from the Polled Hereford herd at Tifton. Weaning data for the 1967 calf crop are shown in Tables 1 and 2.

TABLE 1. Weaning Data, Generation 1 Cows, 1967 Calf Crop

Herd	No. calves weaned	Avg. birth weight	ADG-birth to weaning	Weaning scores Type	Cond.
"Average"	29	67	1.64	11.3	10.1
"Rate of gain"	33	71	1.45	10.2	9.1
"Score"	37	64	1.56	11.2	10.2
"Wean weight"	40	70	1.61	10.1	9.4

TABLE 2. Weaning Data, Generation 2 Cows, 1967 Calf Crop

Herd	No. calves weaned	Avg. birth weight	ADG-birth to weaning	Weaning scores Type	Condition
"Average"	10	64	1.60	11.0	10.0
"Rate of gain"	6	63	1.33	9.9	8.9
"Score"	15	65	1.51	11.1	9.8
"Wean weight"	14	68	1.53	10.0	9.2

V. FUTURE PLANS:

The project will be continued as outlined. Selection of generation 2 females was completed from the 1968 calf crop.

VI. PUBLICATIONS DURING THE YEAR:

Routine annual reports.

VII. PUBLICATIONS PLANNED:

Production data for foundation cows and growth and carcass data for generation 1 steers have been analyzed. These data will be presented for publication as quickly as possible.

Submitted by: W. C. McCormick

I. PROJECT: Animal Husbandry 224, AHRD d1-3 (S-10)

Improvement of Performance and Carcass Quality in Beef Cattle Through Selection.

II. OBJECTIVES:

To develop herds of Polled Hereford and Angus cattle with superior performance.

To progeny test Polled Hereford and Angus sires with selection criteria based on pre- and postweaning growth rate, and carcass meatiness and tenderness.

III. PERSONNEL:

Hollis D. Chapman and W. C. McCormick

IV. ACCOMPLISHMENTS DURING THE YEAR:

The Polled Hereford herd of around 110 females was mated to five sires. Progeny tested sires 47, K-81 and AL-25 were bred to cows designated as superior and to tester cows. Performance tested bulls 173 and 553 were mated to tester cows. The Angus cows were bred artificially to J339, a sire owned jointly with the University of Georgia, and naturally to 517 and 518.

The calves were born January to March. All bull calves were creep-fed. All calves were weaned September 12, 1967. The bulls were placed on feed immediately for 168 days. Both the Angus and Polled Hereford bulls were either fed by sire groups or in lots of 12 or less. At weaning, prospective breeding heifers were separated until small grain pasture was ready to graze. Thereafter, grain feeding was discontinued. Average performance records for all sires are shown in table 1 for bull calves only. At the end of the feeding period, calves sired by Polled Hereford sires 173 and 553 and Angus 517 were slaughtered to obtain carcass data as shown in table 2.

TABLE 1. Growth and Feedlot Data

Breed	Sire	No. bulls calves	Weaned weight	Feedlot daily gain	Final age	Wt./day of age	Type score
PH	AL25	2	528	2.62	415	2.34	12.0
PH	K81	11	481	2.46	376	2.37	11.5
PH	47	11	570	2.60	391	2.58	12.1
PH	173	6	528	2.81	390	2.57	11.9
PH	553	6	457	2.72	381	2.39	11.9
A	J339	8	516	2.72	405	2.41	12.2
A	517	8	461	2.42	389	2.21	11.4
A	518	2	489	2.09	412	2.04	10.1

TABLE 2. Carcass Data

Breed	Sire	No. killed	Dressing percent	Avg. rib eye fat thickness	Average rib eye area/ cwt. carcass	Carcass wt./day of age	Carcass length
PH	173	8	57.8	.30	2.36	1.22	46.1
PH	553	9	55.4	.22	2.43	1.10	44.5
A	517	8	58.1	.39	2.35	1.08	44.1

V. FUTURE PLANS:
The project is being considered for revision.

VI. PUBLICATIONS DURING THE YEAR:

Routine annual reports.

VII. PUBLICATIONS PLANNED:

None.

Submitted by: W. C. McCormick

Production, Inventory, and Performance Data, S-10 Herds - 1967-68

State Georgia

Location	Reidsville	Reidsville	Reidsville	Reidsville	
Breed of Sire	PH	PH	PH	PH	
Breed of Dam	Gr. PH	Gr. PH	Gr. PH	Gr. PH	
Line or Group[1]	Wean Wt.	Rate Gain	Type	Average	
Percent used in project	100	100	100	100	
Inventory as of July 1, 1968 — Cows 2 years and over	52	60	60	60	
Inventory as of July 1, 1968 — Yearling heifers	24	18	28	26	
Inventory as of July 1, 1968 — Bulls & Steers under 1 year	29	22	33	25	
Inventory as of July 1, 1968 — Heifers under 1 year	26	19	19	26	
Inventory as of July 1, 1968 — Bulls over 1 year	2	2	2	2	
Inventory as of July 1, 1968 — Steers over 1 year	13	13	13	11	
Repro. Perf. — Percent pregnant[2]	95	95	97	83	
Repro. Perf. — Calf survival percent[3]	98	98	95	95	
Wean. Perf. — Adj. ADG[4]	1.59	1.43	1.54	1.63	
Wean. Perf. — Av. type sc.[5]	10.1	10.1	11.1	11.2	
Postweaning Performance — No. of bulls	0	0	0	0	
Postweaning Performance — No. of heifers	24	18	28	26	
Postweaning Performance — No. of steers	13	13	13	11	
Slaughtered — No. of bulls	0	0	0	0	
Slaughtered — No. of heifers	0	0	0	0	
Slaughtered — No. of steers	0	0	0	0	
Remarks					

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments: None.
5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1967-68

State Georgia

Location		Reidsville	Reidsville		Tifton	Tifton
Breed of Sire		PH, SG	A,PH,SG		PH	A
Breed of Dam		PHxSG	AxPHxSG		PH	A
Line or Group[1]		Criss cross	Rotational cross		Purebred	Purebred
Percent used in project		100	100		80	80
Inventory as of July 1, 1968	Cows 2 yrs. and over	44	60		93	46
	Yearling heifers	15	29		16	13
	Bulls & Steers under 1 yr.	17	30		39	24
	Heifers under 1 year	18	26		49	21
	Bulls over 1 year	**	**		7	4
	Steers over 1 year	0	0		0	0
Repro. Perf.	Percent pregnant[2]	77	79		91	92
	Calf survival percent[3]	100	98		96	100
Wean. Perf.	Adj. ADG[4]	1.82	1.86		1.90*	1.76*
	Av. type sc.[5]	9.5	10.5		11.6	11.9
Postweaning Performance	No. of bulls				36	18
	No. of heifers				44	20
	No. of steers	8	12		0	0
Slaughtered	No. of bulls				8	3
	No. of heifers				9	5
	No. of steers	8	12			
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments: *Sex (to steer basis) and age of dam.
5 - Suggest S-10 scoring system; indicate if different.
** Same bulls used in three grade groups.

Production, Inventory, and Performance Data, S-10 Herds - 1967-68

State Georgia

Location		Reidsville	Reidsville	Reidsville	Reidsville	Reidsville
Breed of Sire		A	PH	SG	A,PH	A,SG
Breed of Dam		Gr. A	Gr. PH	Gr. SG	AxPH	A,SG
Line or Group[1]		Grade	Grade	Grade	Crisscross	Crisscross
Percent used in project		100	100	100	100	100
Inventory as of July 1, 1968	Cows 2 years and over	42	47	39	49	46
	Yearling heifers	12	17	10	28	17
	Bulls & Steers under 1 year	18	26	18	25	19
	Heifers under 1 year	19	11	16	18	21
	Bulls over 1 year	4	4	4	**	**
	Steers over 1 year	0	0	0	0	0
Repro. Perf.	Percent pregnant[2]	97	89	68	98	90
	Calf survival percent[3]	100	95	89	94	94
Wean. Perf.	Adj. ADG[4]	1.67	1.49	1.94	1.64	1.85
	Av. type sc.[5]	10.8	9.7	9.1	9.9	10.0
Postweaning Performance	No. of bulls					
	No. of heifers					
	No. of steers	8	8	8	8	8
Slaughtered	No. of bulls					
	No. of heifers					
	No. of steers	8	8	8	8	8
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments: None

5 - Suggest S-10 scoring system; indicate if different.

UNIVERSITY OF KENTUCKY
Agriculture Experiment Station
Lexington, Kentucky

I. PROJECT: Animal Science 260 (S-10)

Measurement and Selection of Economically Important Traits in Beef Cattle

II. OBJECTIVES:

To use rate of gain, efficiency of gain, conformation and carcass characteristics in an overall selection experiment.

III. PERSONNEL:

F. A. Thrift, N. W. Bradley, J. D. Kemp and W. P. Garrigus

IV. ACCOMPLISHMENTS DURING THE YEAR:

During April, May and June of 1967, 230 females of varying ages were exposed to 12 bulls, 4 of which were bred artificially. Twenty-nine of these 230 cows were culled from the herd during the fall of 1967 primarily on the basis of their poor reproductive performance.

There were 151 calves (73 bulls and 78 heifers) reared that were born during the 1967 calving season and these were weaned at an average age of 216 days. Approximately ten days after weaning, the bulls were placed on a 150-day postweaning performance test. The heifers remained on pasture and received enough corn silage and supplemental grain to gain approximately 1.0-1.25 pounds per day.

The postweaning feeding test for the bulls was concluded on 2/27/68 and 10 (6 sires represented) of the 73 bulls were selected on the basis of their growth performance as potential herd sires for future use in the herd. At the same time the bulls were weighed off the postweaning test, the heifers were also weighed and their performance during the winter evaluated. Of the 78 heifers available to select from, 40 (9 sires represented) were retained as replacements. A comparison of the performance of the selected bulls and heifers with the performance of all bulls and heifers, respectively, is presented in Table 1.

After the 10 bulls were selected, all remaining bulls were slaughtered so carcass data could be obtained. The information on these 63 bulls is summarized according to sire in Table 2. Also carcass information was obtained on 80 steers and heifers resulting from the progeny testing of 8 sires. This information is summarized according to sire in Table 3.

V. FUTURE PLANS:

Future plans are to revise the project.

VI. PUBLICATIONS DURING THE YEAR:

None.

VII. PUBLICATIONS PLANNED:

Thrift, F. A., N. W. Bradley, J. D. Kemp and J. R. Overfield. 1968 Measurement and Selection of Economically Important Traits on Beef Cattle. Kentucky Animal Sciences Research Reports. Univ. of Ky. Agr. Exp. Sta. Prog. Rpt.

Submitted by: F. A. Thrift

Table 1. Comparison of the Growth Data of Selected Bulls (SB) and Heifers (SH) with all Bulls (AB) and Heifers (AH), respectively (1967 calves).

	Preweaning			Postweaning		
	No.	Adj. ADG[a]	205-Day Wt.[a]	ADG	WDA	365-Day Adj. Wt.[a]
Selected Bulls (SB)	10	1.98	483	2.63	2.49	928
All Bulls (AB)	73	1.65	408	2.36	2.16	806
Difference (SB-AB)		+.33	+75	+.27	+.33	+122
Selected Heifers (SH)	40	1.72	424	1.21	1.61	597
All Heifers (AH)	78	1.57	392	1.08	1.47	546
Differences (SH-AH)		+.15	+32	+.13	+.14	+51

[a]Adjusted for age of dam.

Table 2. Comparison of Various Carcass Traits of Progeny from Several Sires

Sire	No. progeny	Slaughter age	Slaughter wt.	Carcass wt.	Carcass wt./day/age	Fat[a] thick	Rib eye-area	%[b] Cutability
RH1	3	451	913	548	1.21	.32	11.3	51.8
Z6	6	409	800	482	1.18	.26	10.4	52.1
Z44	9	389	788	469	1.20	.23	10.4	52.4
PZ4	7	380	709	421	1.11	.22	10.0	52.6
A41	5	378	765	469	1.24	.29	10.6	52.2
BVH	3	388	793	476	1.22	.23	10.4	52.2
C30	9	397	814	480	1.21	.25	9.9	51.8
HRH14	1	353	790	474	1.34	.15	10.7	53.3
HH6	1	384	864	557	1.45	.25	11.2	52.3
PZ8	9	387	800	487	1.26	.27	11.2	52.5
TR8	10	402	842	513	1.28	.28	10.5	51.9

[a]Measured between 12th and 13th rib
[b]Estimated boneless, trimmed retail cuts.

Table 3. Progeny Test Data

Preweaning				Postweaning			Carcass			
Sire	Adj. ADG	205-day adj. wt.	Type	Final wt.	ADG	Wt./day/age	Rib eye-area	Carcass wt/day/age	% Cut.[a]	Fat thick.[b]
181	1.61	406	11.9	950	1.74	1.76	11.6	1.03	49.5	.62
238	1.54	392	11.6	908	1.66	1.70	11.2	0.98	50.4	.49
155	1.52	389	11.8	927	1.72	1.71	12.4	0.99	51.0	.49
241	1.48	381	11.5	914	1.68	1.69	11.0	1.01	48.6	.69
284	1.50	384	10.5	948	1.78	1.76	11.8	1.08	49.3	.65
280	1.41	365	11.0	891	1.66	1.66	11.8	0.99	50.4	.54
279	1.36	356	10.9	886	1.66	1.64	11.3	0.96	49.9	.57
150	1.35	354	10.9	894	1.68	1.65	11.2	0.95	50.9	.46

[a] Estimated boneless, trimmed retail cuts.

[b] Measured between 12th and 13th rib.

Production, Inventory and Performance Data S-10 Herds - 1967-68

State Kentucky

Location		Princeton	Mereworth Farms	Walnut Hall Farm		
Breed of Sire		Hereford	Hereford	Hereford		
Breed of Dam		Hereford	Hereford	Hereford		
Line or group[1]		Purebred	Grade	Grade		
Percent used in project		100	100	100		
Inventory as of July 1, 1968	Cows 2 years and over	191	125	-		
	Yearling heifers	40	0	0		
	Bulls & Steers under 1 year	74	0	0		
	Heifers under 1 year	87	0	0		
	Bulls over 1 year	42	0	0		
	Steers over 1 year		0	0		
Repro. Perf.	Percent pregnant[2]	93.1	a	-		
	Calf survival percent[3]	93.8	a	-		
Wean. Perf.	Adj. ADG[4]	1.61		1.46[b]		
	Av. type sc.[5]	11.3		11.2[b]		
Postweaning Performance	No. of bulls	73				
	No. of heifers	78		44		
	No. of steers			36		
Slaughtered	No. of bulls	63				
	No. of heifers			44		
	No. of steers			36		
Remarks						

[a]Cows bred to 5 bulls -- winter of 1968 for progeny testing
[b]Calves calved in 1966

1- Purebreds, grade, line, sire number, crosses, treatment, etc.
2- Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 -Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4- Indicate adjustments: Adjusted for age of dam, sex and to 205-days.
5- Suggest S-10 scoring system; indicate if different.

LOUISIANA STATE UNIVERSITY
Agricultural Experiment Station
Baton Rouge, Louisiana

I. PROJECT: Hatch 605 (Revised)

Evaluation of Systematic Rotational Crossbreeding Plans for Producing Beef Cattle in the Gulf Coast Region

II. OBJECTIVES:

(a) To evaluate systematic rotational crossbreeding plans as breeding systems for commercial beef production

(b) To determine the degree of heterotic advantage maintained in subsequent generations of rotational crossbreeding.

(c) To determine the relative productivity of various types of crossbred cows.

(d) To estimate genetic parameters.

(e) To study specific crossbreeding programs of various breeds as to production, usefulness and practicality.

(f) To study management and production problems associated with crossbred cattle produced under systematic crossbreeding schemes.

III. PERSONNEL:

J. W. Turner, George L. Robertson, A. M. Mullins, C. K. Vincent, R. Hollis Klett, T. O. McRae, S. E. McCraine and Dorothy C. Wilson.

IV. ACCOMPLISHMENTS DURING THE YEAR:

1. Scope and nature of work

The 1967 calf crop was the seventh produced under the original project outline of comparing contemporary straightbred, singlecross, backcross and three-breed cross calves. Purebred and crossbred cattle of Angus, Brahman, Brangus, Charolais and Hereford breeding are used in the project. Revision plans call for 11 herds; 4 straightbred, 3 crisscross, 3 three-breed roationals and 1 four-breed rotational; to be set up by the 1969 breeding season with straightbred and Brahman singlecross cows. Only four breeds (Angus, Brahman, Charolais and Hereford) will be used in the revised project. All of the systematic rotational breeding herds will be combinations with the Brahman breed, and F_1 Brahman cows will be used in the initial stages.

Data collection will continue to include measures of reproductive, preweaning, postweaning and carcass traits.

2. Research results

Preliminary analyses have been completed on preweaning, postweaning and carcass data collected from the various contemporary mating types of calves. Several manuscripts have been prepared for technical and popular publication.

Analyses of preweaning data indicate that the three-breed cross calf is the superior mating type. This, of course, is a major reflection on the producing ability of the singlecross brood cow. The calves generally rank three-breed, backcross, singlecross and straight-bred over breeds of sire for the preweaning traits. Comparisons among types of singlecross cows revealed that the Brahman singlecross are superior to British crosses. Also, differences between reciprocal cross cows are small and generally nonsignificant. Yet the crossbred cow from the Brahman dam foundation is generally superior to the reciprocal.

Mr. John B. Mailhes, Jr. completed requirements for the Master of Science degree by analyzing and preparing a thesis entitled "Heterotic Effects in Postweaning and Carcass Traits of Beef Steers." Heterotic effects were generally small and nonsignificant for the crosses studied. Those traits that did show a significant heterotic effect were related to growth.

Tables 1 through 5 contain least-squares means and differences referred to in the previous section.

V. FUTURE PLANS:

Data collection and operation under the revised project outline will begin with the 1969 breeding season. New formats for data cards will be developed shortly for preweaning, postweaning, carcass and puberty data.

VI. PUBLICATIONS DURING THE YEAR:

Turner, J. W. (Bill), B. R. Farthing and George L. Robertson. 1968. Heterosis in reproductive performance of beef cows. J. Animal Sci. 27:336.

Turner, J. W. 1968. Crossbreeding beef cattle for the sub-tropics. SPAN 11:1:55.

Mailhes, John Baptiste, Jr. 1968. Heterotic effects in postweaning and carcass traits of beef steers. M.S. Thesis. Louisiana State University, Baton Rouge, Louisiana.

VII. PUBLICATIONS PLANNED:

1) Mating-type comparisons among crossbred beef cattle. I. Preweaning traits

2) Mating-type comparisons among crossbred beef cattle. II. Postweaning and carcass traits

3) Preweaning production differences among reciprocal crossbred beef cows

4) Heterotic effects in postweaning and carcass traits of beef steers

Submitted by: J. W. Turner, Project Leader
Animal Science Dept.,
Louisiana State University

TABLE 1. LEAST-SQUARES MEANS FOR PREWEANING PERFORMANCE

Mean	Number M	Number F	Birth weight M	Birth weight F	A.D.G. M	A.D.G. F	Slaughter score[a] M	Slaughter score[a] F	Type score[a] M	Type score[a] F	Weaning weight M	Weaning weight F
μ	505	471	69.8	64.7	1.7	1.6	9.2	9.9	10.5	10.9	424.2	403
Year												
1961	61	67	70.0	64.7	1.7	1.6	8.2	8.5	9.3	9.5	432.3	406
1962	92	74	71.9	67.7	1.7	1.6	9.1	9.6	10.8	11.1	422.5	402
1963	72	51	70.2	67.1	1.7	1.6	8.3	9.2	10.7	11.5	425.2	410
1964	71	78	67.6	63.9	1.6	1.5	9.4	10.1	10.7	11.2	405.9	381
1965	70	61	66.4	60.3	1.7	1.6	9.3	10.2	10.3	10.8	418.0	399
1966	65	61	72.5	66.3	1.8	1.7	10.4	11.2	11.0	11.4	438.1	418
1967	74	79	70.1	63.2	1.7	1.6	10.0	10.7	11.0	11.1	427.5	405
Breed of Sire												
Angus (1)	133	135	63.2	60.6	1.6	1.6	9.5	10.0	10.8	11.1	399.4	382
Brahman (2)	114	110	75.4	66.3	1.8	1.7	9.1	9.6	10.2	10.5	445.1	414
Brangus (3)	139	98	71.4	64.9	1.7	1.6	9.0	9.6	10.4	10.8	430.7	411
Hereford (4)	119	128	69.2	67.1	1.7	1.6	9.4	10.3	10.9	11.4	421.7	404
Mating type												
Straightbred (1)	95	96	65.7	59.7	1.5	1.5	8.7	9.4	10.1	10.5	379.5	364
Singlecross (2)	116	116	70.4	65.7	1.7	1.6	9.1	9.7	10.4	10.8	421.2	399
Backcross (3)	139	119	70.8	65.6	1.8	1.7	9.4	10.1	10.7	11.1	437.1	410
Three-breed (4)	155	140	72.4	67.9	1.9	1.7	9.7	10.4	11.0	11.4	459.1	43[illegible]
Breed of Sire X mating type												
11	19	25	58.5	53.9	1.4	1.3	8.8	9.6	10.2	10.8	340.6	32[illegible]
12	33	28	58.9	60.0	1.7	1.6	9.5	9.8	10.6	10.7	400.9	38[illegible]
13	41	33	68.5	62.4	1.8	1.8	9.8	10.7	11.1	11.8	449.9	43[illegible]
14	40	49	67.0	66.0	1.6	1.5	9.8	10.0	11.1	11.1	406.3	38[illegible]
21	31	18	69.6	62.9	1.6	1.5	8.6	9.3	9.8	10.1	401.8	37[illegible]
22	22	26	79.9	68.1	1.8	1.7	9.0	9.6	9.9	10.6	443.1	42[illegible]
23	32	35	74.7	66.7	1.8	1.6	9.2	9.6	10.3	10.5	445.0	40[illegible]
24	29	31	77.4	67.4	2.0	1.8	9.4	10.0	10.6	10.9	490.7	45[illegible]
31	27	25	67.6	60.1	1.5	1.5	8.5	8.6	9.8	10.1	379.9	36[illegible]
32	35	23	67.8	62.3	1.8	1.6	9.0	9.4	10.5	10.6	439.5	40[illegible]
33	34	20	73.1	67.8	1.7	1.7	8.8	9.8	10.4	10.9	431.4	43[illegible]
34	43	30	77.4	69.5	1.9	1.8	9.5	10.4	10.9	11.5	471.8	44[illegible]
41	18	28	67.0	61.8	1.6	1.5	8.9	10.0	10.5	11.0	395.6	38[illegible]
42	26	39	75.0	72.4	1.6	1.5	8.9	10.1	10.4	11.1	401.5	38[illegible]
43	32	31	66.9	65.6	1.7	1.6	9.7	10.3	11.1	11.3	422.1	39[illegible]
44	43	30	67.9	68.7	1.9	1.8	9.9	11.1	11.4	12.0	467.5	4[illegible]

[a]A score of 10 denotes a grade of average good with each unit change representing one third of a grade.

TABLE 2. LEAST-SQUARES MEANS FOR POSTWEANING PERFORMANCE

ean	Number		Birth weight		A.D.G.		Slaughter score[a]		Type score[a]		Weaning weight	
	M	F	M	F	M	F	M	F	M	F	M	F
	562	517	72.9	67.9	1.8	1.7	9.4	10.0	10.8	11.1	448.9	420.7
ear												
961	66	75	73.3	68.3	1.8	1.7	8.3	8.5	9.4	9.4	451.6	418.0
962	91	76	74.6	70.7	1.8	1.7	9.2	9.6	11.0	11.2	447.2	414.3
963	87	64	73.3	69.9	1.8	1.7	8.4	9.4	10.9	11.8	453.8	428.8
964	77	87	71.2	66.4	1.7	1.6	9.5	10.1	10.9	11.3	429.3	397.7
965	76	69	69.2	64.6	1.8	1.7	9.4	10.3	10.5	10.9	440.5	421.8
966	68	66	75.5	68.9	1.8	1.7	10.5	11.4	11.3	11.7	462.8	433.1
967	97	80	73.5	66.4	1.8	1.8	10.3	10.9	11.3	11.6	457.2	431.4
reed of Sire												
ngus (1)	114	110	64.5	62.9	1.7	1.6	9.7	10.2	10.9	11.2	420.0	399.3
rahman (2)	83	92	78.2	68.5	1.8	1.7	9.2	9.8	10.3	10.7	460.0	422.1
rangus (3)	112	73	71.2	66.2	1.7	1.6	9.1	9.5	10.5	10.7	433.5	411.2
harolais (4)	152	142	80.5	73.9	1.9	1.8	9.2	9.9	11.0	11.4	482.8	447.5
ereford (5)	101	100	70.2	67.9	1.8	1.7	9.6	10.7	11.1	11.7	448.4	423.4
Mting type												
Snglecross (2)	145	147	71.8	66.6	1.7	1.6	9.1	9.7	10.4	10.8	428.0	401.7
Bckcross (3)	201	189	73.7	68.2	1.8	1.7	9.4	10.1	10.9	11.2	454.5	426.5
Tree-breed (4)	216	181	73.3	68.9	1.9	1.7	9.6	10.3	11.0	11.4	464.4	434.0
Beed of sire Xmating type												
12	33	28	61.7	63.5	1.6	1.5	9.4	10.1	10.7	10.9	397.9	380.9
13	41	33	65.1	63.2	1.7	1.6	9.8	10.2	11.1	11.3	426.9	392.5
14	40	49	66.8	62.0	1.8	1.8	9.9	10.3	11.1	11.4	435.3	424.4
22	22	26	76.4	65.8	1.7	1.5	8.9	9.1	9.7	10.2	422.5	384.1
23	32	35	79.9	70.0	1.8	1.8	8.9	10.0	10.2	10.8	458.9	443.5
24	29	31	78.3	69.5	2.0	1.8	9.8	10.4	10.9	11.1	498.6	438.8
32	35	23	72.6	65.9	1.6	1.7	8.9	9.4	10.2	10.6	417.9	413.0
33	34	20	71.2	64.4	1.7	1.6	9.1	9.5	10.5	10.7	427.8	405.5
34	43	30	69.7	68.4	1.8	1.6	9.3	9.8	10.9	10.8	454.6	415.0
42	29	31	72.5	67.5	1.9	1.7	9.1	9.5	10.9	10.9	469.1	418.3
43	62	70	85.5	78.7	2.1	1.9	9.4	10.0	11.3	11.6	515.0	476.3
44	61	41	83.6	75.5	1.8	1.8	9.2	10.1	10.8	11.6	464.4	448.0
52	26	39	76.0	70.2	1.7	1.6	9.1	10.3	10.6	11.3	432.5	412.1
53	32	31	66.8	64.5	1.8	1.7	9.8	10.7	11.3	11.6	443.7	414.5
54	43	30	67.9	68.9	1.9	1.8	10.0	11.0	11.4	12.1	469.0	443.8

[a]A score of 10 denotes a grade of average good with each unit change representing one third of a grade.

TABLE 3. LEAST-SQUARES CONSTANTS AND COMPARISONS FOR RECIPROCAL COWS PRODUCING STEER CALVES

Breeding classification[a,b]	Number	Birth weight	A.D.G.	Type score[c]	Slaughter score[c]	Weaning weight
μ	330	72.63	1.811	10.92	9.55	454.21
A X B	37	-6.00	0.063	-.04	0.13	7.36
B X A	24	-8.38	0.076	0.37	0.32	7.69
$\bar{d} \pm s_{\bar{d}}$		2.38 ± 2.71	0.013 ± 0.053	0.41 ± 0.254	0.19 ± 0.248	0.33 ± 12.43
A X BA	32	1.62	-.020	0.07	-.35	-1.39
BA X A	20	1.08	-.139	-.33	-.46	-25.60
$\bar{d} \pm s_{\bar{d}}$		0.54 ± 2.93	0.119* ± 0.057	0.40 ± 0.275	0.11 ± 0.268	24.21 ± 13.45
A X H	23	6.79	-.199	-.08	-.19	-36.79
H X A	26	0.49	-.173	-.28	-.18	-39.65
$\bar{d} \pm s_{\bar{d}}$		6.30* ± 3.06	0.026 ± 0.059	0.20 ± 0.287	0.01 ± 0.280	2.86 ± 14.04
B X BA	41	-2.51	-.051	-.13	-.02	9.42
BA X B	16	-3.04	0.119	0.50	0.85	19.42
$\bar{d} \pm s_{\bar{d}}$		0.53 ± 3.29	0.170** ± 0.064	0.63* ± 0.308	0.83** ± 0.301	10.00 ± 15.09
B X H	27	-4.14	0.131	0.01	0.18	24.27
H X B	39	-0.23	0.132	0.26	0.26	27.46
$\bar{d} \pm s_{\bar{d}}$		3.39 ± 2.46	0.001 ± 0.048	0.25 ± 0.231	0.08 ± 0.225	3.19 ± 11.30
B X H	23	5.24	-.023	-.25	-.32	1.46
H X BA	53	9.07	-.017	-.09	-.22	6.34
$\bar{d} \pm s_{\bar{d}}$		3.83 ± 3.00	0.006 ± 0.058	0.16 ± 0.282	0.10 ± 0.275	4.88 ± 13.80

[a]Breeds coded: A = Angus, B = Brahman, BA = Brangus and H = Hereford

[b]Breed of sire appears first in denoting breeding of crossbred cow, i.e., A X B is cow produced by mating Angus bull to Brahman female.

[c]A score of 10 denotes a grade of average good with each unit change representing one-third of a grade.

*(P < .05)
**(P < .01)

TABLE 4. LEAST-SQUARES CONSTANTS AND COMPARISONS FOR RECIPROCAL COWS PRODUCING HEIFER CALVES

Breeding classification [a,b]	Number	Birth weight	A.D.G.	Type score[c]	Slaughter score[c]	Weaning weight
μ	276	67.51	1.710	11.27	10.19	428.58
A X B	21	-.90	0.095	0.09	0.12	19.86
B X A	22	-2.73	0.061	0.33	0.35	9.08
$\bar{d} \pm s_{\bar{d}}$		1.83 ± 2.79	0.03 ± 0.053	0.24 ± 0.305	0.23 ± 0.303	10.78 ± 12.07
A X BA	20	0.01	-.096	-.23	-.37	-14.44
BA X A	13	-.58	-.077	-.21	-.27	-23.25
$\bar{d} \pm s_{\bar{d}}$		0.59 ± 3.64	0.02 ± 0.069	0.02 ± 0.397	0.10 ± 0.395	8.81 ± 15.72
A X H	26	2.21	-.161	-.23	-.09	-30.58
H X A	19	-2.36	-.216	-.26	-.56	-50.47
$\bar{d} \pm s_{\bar{d}}$		4.57 ± 3.05	0.06 ± 0.058	0.03 ± 0.333	0.47 ± 0.332	19.89 ± 13.19
B X BA	34	-.05	0.106	0.20	0.41	21.86
BA X B	14	-2.25	0.090	-.27	-.03	18.01
$\bar{d} \pm s_{\bar{d}}$		2.20 ± 3.12	0.02 ± 0.059	0.47 ± 0.341	0.44 ± 0.339	3.85 ± 13.49
B X H	31	-.39	0.051	-.05	-.08	10.37
H X B	29	0.88	0.193	0.43	0.54	42.20
$\bar{d} \pm s_{\bar{d}}$		1.27 ± 2.46	0.14** ± 0.047	0.48 ± 0.269	0.62* ± 0.268	31.83** ± 10.66
BA X H	17	5.61	-.036	-.08	-.15	-3.55
H X BA	30	5.60	-.011	0.19	-.02	0.90
$\bar{d} \pm s_{\bar{d}}$		0.01 ± 2.76	0.03 ± 0.052	0.27 ± 0.302	0.13 ± 0.300	4.45 ± 11.95

[a] Breeds coded: A = Angus, B = Brahman, BA = Brangus and H = Hereford

[b] Breed of sire appears first in denoting breeding of crossbred cow, i.e., A X B is cow produced by mating Angus bull to Brahman female.

[c] A score of 10 denotes a grade of average good with each unit change representing one-third of a grade.

*($P < .05$)
**($P < .01$)

TABLE 5. REALIZED CROSSBRED ADVANTAGE AND PERCENT HETEROSIS EXHIBITED FOR POSTWEANING AND CARCASS TRAITS

	No.	Slaughter weight	Feedlot ADG	Carcass grade[a]	Hot dressing percent	Shear strength	Rib-eye area per cwt. cold carcass weight	Yield grade
Angus & Brahman	44							
Crossbred mean	14	819.84	2.15	10.86	61.66	27.80	1.95	3.72
Purebred mean	30	687.86	1.65	10.29	61.23	26.06	2.11	2.76
Difference		131.98	0.50	0.57	0.43	1.74	-.16	0.96
Percent heterosis		19.18**	30.30**	5.53	0.70	6.67	-7.58	34.78**
Angus & Brangus	49							
Crossbred mean	19	765.65	1.87	12.13	60.64	22.54	1.95	3.32
Purebred mean	30	754.27	1.88	11.15	59.33	24.78	2.09	2.92
Difference		11.38	-.01	0.98	1.31	-2.24	-.14	0.40
Percent heterosis		1.50	-.53	8.78**	2.20	-9.03	-6.69	13.69
Angus & Hereford	46							
Crossbred mean	17	786.71	2.05	11.68	61.83	22.96	1.86	3.99
Purebred mean	29	726.32	1.92	11.60	60.02	23.59	2.02	3.42
Difference		60.39	0.13	0.08	1.81	-.63	-.16	0.57
Percent heterosis		8.31**	6.77	0.68	3.01*	-2.67	-7.92*	16.66**
Brahman & Brangus	67							
Crossbred mean	19	806.01	1.91	9.87	60.96	27.02	1.96	2.81
Purebred mean	48	748.18	1.74	9.64	60.74	27.10	2.02	2.80
Difference		57.83	0.17	0.23	0.22	-.08	-.06	0.01
Percent heterosis		7.72*	9.77	2.38	0.36	-.29	-2.97	0.35
Brahman & Hereford	36							
Crossbred mean	8	797.81	2.06	11.48	63.33	24.19	1.97	3.23
Purebred mean	28	724.42	1.85	10.18	61.33	26.45	1.96	3.18
Difference		73.39	0.21	1.30	2.00	-2.26	0.01	0.05
Percent heterosis		10.13	11.35	12.77*	3.26	-8.54	0.51	1.57
Brangus & Hereford	55							
Crossbred mean	16	836.52	2.14	10.18	60.46	21.72	1.86	3.71
Purebred mean	39	766.42	1.96	10.94	59.43	23.71	2.02	3.17
Difference		70.10	0.18	-.76	1.03	-1.99	-.16	0.54
Percent heterosis		9.14	9.18	-6.94	1.73	-8.39	-7.92	17.03

[a]A score of 10 denotes a grade of average good with each unit change representing one-third of a grade.

*(P < .05)

Production, Inventory, and Performance Data S-10 Herds - 1967-68

State Louisiana

Location		Baton Rouge	Baton Rouge	Baton Rouge	Baton Rouge	Baton Rouge
Breed of Sire		(a)	(a)	(a)	(a)	(a)
Breed of Dam		Angus	Angus cross	Brahman	Brahman cross	Brangus
Line or group[1]		(b)	(c)	(b)	(c)	(b)
Percent used in project		100	100	100	100	100
Inventory as of July 1, 1968	Cows 2 years and over	45	52	20	48	24
	Yearling heifers	12	2	11	41	0
	Bulls & Steers under 1 year	11	22	1	15	3
	Heifers under 1 year	17	13	6	16	6
	Bulls over 1 year	2	0	4	0	0
	Steers over 1 year	0	0	0	0	0
Repro. Perf.	Percent pregnant[2]	67	85	85	87	83
	Calf survival percent[3]	88	88	91	98	88
Wean. Perf.	Adj. ADG[4]	1.52	1.77	1.67	1.85	1.77
	Av. type sc.[5]	11	12	11	12	11
Postweaning Performance	No. of bulls					
	No. of heifers					
	No. of steers	2	23	5	20	4
Slaughtered	No. of bulls					
	No. of heifers					
	No. of steers	2	23	5	19	4
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:
5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1967-68

State Louisiana

Location		Baton Rouge	Baton Rouge	Baton Rouge	Baton Rouge	Baton Rouge
Breed of Sire		(a)	(a)	(a)	(a)	(a)
Breed of Dam		Brangus cross	Charolais	Char. cross	Here.	Here. cross
Line or group[1]		(c)	(d)	(d)	(b)	(c)
Percent used in project		100	100	100	100	100
Inventory as of July 1, 1968	Cows 2 years and over	18	2	85	28	36
	Yearling heifers	0	1	16	12	16
	Bulls & Steers under 1 year	20	1	28	3	33
	Heifers under 1 year	15	1	33	6	31
	Bulls over 1 year	0	3	0	3	0
	Steers over 1 year	0	0	0	0	0
Repro. Perf.	Percent pregnant[2]	79	50	65	70	77
	Calf survival percent[3]	93	100	88	83	97
Wean. Perf.	Adj. ADG[4]	1.76	2.37	1.96	1.44	1.72
	Av. type sc.[5]	12	12	12	11	12
Postweaning Performance	No. of bulls					
	No. of heifers					
	No. of steers	19	1	38	2	21
Slaughtered	No. of bulls					
	No. of heifers					
	No. of steers	19	1	35	1	20
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:
5 - Suggest S-10 scoring system; indicate if different.

EXPLANATORY NOTES

for

PRODUCTION, INVENTORY AND PERFORMANCE DATA SHEETS

Louisiana Project 605 (S-10)

(a) All breeds of cows bred to five breeds of bulls (Angus, Brahman, Brangus, Charolais and Hereford).

(b) Straightbred cows bred to all five breeds of bulls to produce straightbred calves (Angus, Brahman, Brangus, Charolais and Hereford) and singlecross calves (A-B, B-A, A-BA, BA-A, A-H, H-A, B-H, H-B, H-BA, BA-H, B-BA, BA-B, C-A, C-B, C-BA, C-H)

(c) Crossbred cows bred to all five breeds of bulls to produce backcross, 3-breed cross and rotational cross calves.

(d) Charolais and Charolais-cross cows bred to Charolais bulls.

4 No adjustment on ADG

5 10 represents Average Good with unit change equal to one-third grade.

IBERIA LIVESTOCK EXPERIMENT STATION
Jeanerette, Louisiana

I. PROJECT: 03-30-002-19-06 (Revision No. 2)

Selection for changes in leanness of beef cattle and a study of the response to selection for adaptability in the Gulf Coast area.

II. OBJECTIVES:

1. To determine whether changes in leanness of Angus and Brangus cattle can be made by selection in opposite directions for fatness.

2. To estimate genetic and environmental relationships of fatness and leanness with other carcass and production traits.

3. To evaluate if more rapid adaptation and performance of Angus cattle to the Gulf Coast area can be made by selection of the best available replacements from within the area or by selection of the best available replacement (sires) from outside the area.

III. PERSONNEL:

T. M. DeRouen, D. C. Meyerhoeffer, and W. L. Reynolds, Jeanerette, La.

A. M. Mullins, R. F. Boulware and J. W. Turner, Baton Rouge, La.,

E. J. Warwick, Beltsville, Maryland.

IV. ACCOMPLISHMENTS DURING THE YEAR:

1. Scope of Work:

Data were collected on the various aspects of the fat investigation and the adaptability study. Numbers are small and at this time it is not possible to note differences of any magnitude.

There were eight single sire herds for the Brangus in the fat study -- four selected for high fat and four selected for low fat. The Angus females in the fat study were grades. The Angus cattle in the adaptability investigation were purebred. They were sorted into six single sire herds. Four of these herds were bred naturally to bulls raised and grown in the herd on the station. Two other herds were mated artificially to bulls raised outside the Gulf Coast area. The artificial insemination studs of the United States are canvassed for bulls. Several of the performance traits measured on the progeny of the "local" sires and the "outside" bulls include growth rate, conformation, reproduction and carcass merit and quality.

2. Research Results:

a. Breeding season and conception:

A total of 307 cows were sorted into 22 single sire herds. Two of these herds were bred by artificial insemination. The breeding season began on May 1 and the bulls stayed in the pasture with the cows for 75 days.

All cows exposed to bulls during the breeding season were palpated for pregnancy during late October and early November. A summary of the conception rate is shown in Table 1.

Table 1. Summary of Palpation for 1967

Breed	Study	No. Cows Exposed[b/]	No. Cows Pregnant	Percent Pregnant
Brangus	Hi fat	58	47	81
Brangus	Lo fat	69	49	71
Angus	Hi fat	47	32	68
Angus	Lo fat	49	39	80
Angus	Adapt-Local	51	44	86
Angus	Adapt-outside a/	29	21	72
Totals and Average		303	232	76

a/ Artificially inseminated

b/ Four cows died after breeding season

The conception rate for 1967 was approximately average for the cattle at the station. There were a few reciprocal first cross (Angus x Brahman, Brahman x Angus) cows in the Brangus herds. These F_1 cows have always had a higher pregnancy rate (97%) than the other breed groups. Angus cows at the station have consistently had a greater conception rate than the Brangus.

Several young heifers were purchased to get numbers up to that required for the Angus fat study and the Angus adaptability experiment. It was noted that the fecundity of the purchased heifers in the fat study was disappointing while that of the purchased adaptability heifers was good.

Differences in the conception rate of the Brangus females indicated that the high fat line was greater than the low fat line by ten percent. Pregnancy rate of the Angus in the fat investigation showed that the high fat line was less than the low fat line (Table 1).

Conception in the "local" adaptability line (Angus) was 86 percent. They were mated naturally on pasture. All females in the "outside" line were bred artificially and the pregnancy rate was 72 percent.

b. Calving:

Calf losses in 1967 were one of the lowest on record at the station (Table 2). Mortality of calves during the first 72 hours post-partum was 2.5 percent. Weather conditions during calving were almost ideal. Temperatures were mild and there were few heavy rains. Another factor which may have helped reduce losses, was that calving was moved back from January 15 to February 1, and thus, allowing calves to be born during less severe and drastic weather. No calves were lost from drowning this year. Mortality of calves after 72 hours post-partum and before weaning was one percent (Table 2).

Table 2: Mortality of Calves During 1967

Breed	Losses 1st. 72 hrs. Male	Female	Dead No.	%	Losses after 72 hours Male	Female	Dead No.	%	Totals No. Dead	% Dead	No. Born
Brangus	1	1	2	2	1	0	1	1	3	3	92
Angus - Fat	2	0	2	3	0	1	1	1	3	4	70
Angus - Adpt.	1	0	1	3	0	0	0	0	1	3	35
Totals & Means	4	1	5	2.5	1	1	2	1	7	4	197

C. Cow Performance - 1967 Calf Crop:

There was very little difference in the performance and production of the cows within a study, except for the adaptability investigation (Table 3).

Progeny of cows in the "local" (adaptability) herd grew slightly faster and were heavier than similar calves from cows in the "outside" herd. However, calves in the "outside" herd had a type or conformation score that was one-third of a grade higher than their contemporaries in the "local" herd. It is noted that numbers for the "outside" herd were small.

Cow performance for the Brangus fat and the Angus fat investigation were quite similar within each breed (Table 3).

Table 3: Cow Performance - 1967 Calf Crop

Breed of sire	Brangus	Brangus	Angus	Angus	Angus	Angus
Breed of dam	Brangus	Brangus	Angus	Angus	Angus	Angus
Group	Hi fat	Lo fat	Hi fat	Lo fat	Adpt-local	Adpt-Outside
No. cows exposed 1/	51	58	41	40	35	13
No. calves born 2/	41	51	38	32	26	9
Ave. birth wt.	61	69	57	61	59	68
No. calves weaned	39	49	36	31	25	9
% Calves weaned	95	96	95	97	96	100
Ave. wean. age (days)	176	179	179	178	179	178
Actual wean. wt.	372	366	312	324	333	307
Adj. ave. - daily gain 3/	1.83	1.78	1.61	1.64	1.63	1.48
Ave. type score 4/	9.4	9.4	10.3	10.4	11.5	12.6
Ave. condition score 4/	8.5	8.3	8.6	8.7	9.7	9.7
Fat thickness (mm)	5.1	4.9	4.3	4.4	----	-----
Index 6/	111	114	105	108	112	113

1/ Some cows culled for low production after weaning calves.

2/ Includes dead and live calves.

3/ Adjusted for sex of calf and age of dam.

4/ Choice = 12, 13, 14; Good = 9, 10, 11.

5/ Artificially inseminated.

6/ Equal emphasis to growth and to conformation.

d. Growth of Replacement Heifers:

These heifers were bred and raised on the station. One group was born in 1966 and the other in 1967. (Tables 4 and 5).

Four pounds of a concentrate mixture was fed per head daily to these heifers on pasture during winter. The mixture consisted of 9 parts corn and 1 part cottonseed meal measured by weight. Feeding usually begins about November 15 and is continued until approximately March 1. They are fed for 90 to 110 days, depending on weather conditions and growth of forages.

Brangus heifers tend to make their best growth during warm weather. Angus heifers usually make better gains during cool weather. However, cold, wet winters are extremely hard on all heifers and they usually lose weight during this time. The weight loss is dependent on the severity of the weather.

The weights and growth of these heifers are shown in Tables 4 and 5.

Table 4: Growth of Replacement Heifers Born in 1966.

Breed	No.	Yrlg. weight 2/15/67	Weight 6/18/67	ADG	18 month weight 8/25/67	ADG	20 month weight 10/18/67	ADG	21 month weight 11/29/67	ADG
Brangus	29	494	601	.80	645	.79	659	.67	653	.55
Angus - fat	7	398	513	.93	546	.77	544	.60	553	.62
Angus - Adpt.	15	422	533	.83	554	.69	552	.53	560	.48

Table 5: Growth of Replacement Heifers born in 1967

Breed	No.	Wean. wt. 180-days	Weight 11/30/67	ADG
Brangus	34	369	436	1.02
Angus-fat	35	303	366	1.05
Angus-Adpt.	17	304	358	0.88

e. Postweaning Performance of Bulls - 1967

Immediately after weaning, weighing and scoring, bull calves are placed in dry lot and fed ad lib. Each bull in the fat study is fed to a constant weight of 800 pounds (Table 6). At this weight, an ultrasonic instrument is used to estimate fat thickness over the 12th and 13th rib. The three bulls in each breed with the greatest thickness of fat are retained for breeders in the high fat line and those in the low fat line with the least fat thickness are kept for replacements in each breed - Angus and Brangus. Bulls in the adaptability study are fed to a constant age of 365 days for each calf. At this time, growth and conformation are evaluated and an index is computed for each bull. Equal emphasis is given to each trait. The three bulls with the highest indexes in the "local" line are kept for replacements. No replacement bulls are retained for the "outside" sires.

Twenty-five to fifty percent of the bull progeny are slaughtered for carcass evaluation with samples of calves from all sires in the fat and the adaptability investigation.

Bulls from the low fat lines in the Angus and the Brangus gained at a faster rate and reached 800 pounds sooner than bulls in the high fat lines (Table 6).

Fat thickness between the high and the low fat lines was small for the Angus and for the Brangus within each breed (Table 6).

Numbers for comparison in the adaptability investigation are too small to discuss differences (Table 6). During the last days on feed test, one Angus bull progeny from the "outside" line became a chronic, severe bloater. This animal lost considerable weight and was removed from the test.

Table 6: Post-weaning Performance of Bulls Fed in 1966-67

Breed	Brangus	Brangus	Angus	Angus	Angus	Angus
Breed of Sire	Brangus	Brangus	Angus	Angus	Angus	Angus
Breed of Dam	Brangus	Brangus	Angus	Angus	Angus	4/Angus
Study	Hi Fat 1/	Lo Fat 1/	Hi Fat 1/	Lo Fat 1/	Adpt.Local	Adapt A.I. 4/
No. in group	11	14	5	7	8	2
Ave. Initial wt.	420	431	317	371	348	305
No. days fed	164	149	224	175	186	186
Ave. final wt.	797	801	800	801	769	762
Adg. on test	2.41	2.55	2.18	2.42	2.27	2.45
Ave. age end test (days)	345	329	402	355	365	365
Ave. type score 2/	9.8	9.7	11.2	11.5	11.6	11.7
Ave. cond. score	9.5	9.4	11.3	10.9	11.0	10.9
Fat thickness (mm) 3/	9.4	7.6	10.8	9.8	----	----
Fat thickness (ins)	.37	.30	.42	.38	----	----
Feed/lb/ gain	----	----	----	------	7.12	6.61
% Zebu	40.41	40.53	0	0	0	0
% Inbreeding	1.13	1.05	0	0	0	0

1/ Each bull fed to a weight constant of 800 lbs + or - 10 lbs.

2/ Choice = 12, 13, 14; Good = 9, 10, 11

3/ Measured when each bull attained 800 pounds.

4/ Each bull fed to an age constant of 365 days.

f. Slaughter Data of Bulls - 1967

Numbers are small, the study is in its infancy, and consequently, there are differences that are difficult to explain. The summary of the slaughter information on the bulls is presented in Table 7.

A reason for the discrepancy in the fat thickness between the high and the low lines, especially for the Angus, is that the bulls were kept on full feed until all of them had reached 800 pounds. This is done so that all bulls will have a chance to be selected in either the high fat or the low fat line. The bulls that attain 800 pounds early are on feed longer. Angus Bulls appear to mature earlier than the Brangus, and consequently, put on more fat. This was true for the Angus bulls in the low fat line in 1967 (Table 7).

It is observed that the low fat bulls in the Angus and the Brangus were more tender than the ones in the high fat line (Table 7). This trend was also noted in 1966.

Numbers are small for all groups within a study.

Table 7: Slaughter Data of Bulls - 1967

Breed	Brangus	Brangus	Angus	Angus	Angus	Angus
Breed of Sire	Brangus	Brangus	Angus	Angus	Angus	Angus
Breed of Dam	Brangus	Brangus	Angus	Angus	Angus	Angus
Study	Hi fat	Lo fat	Hi fat	Lo fat	Adapt. (local)	Adapt. (outside)
No. slaughtered	5	8	3	4	3	2
Slaughter age (days)	429	422	441	424	422	410
Days fed	248	242	264	245	240	231
Final wt. (feed lot)	875	952	815	860	793	820
Slaughter wt. (a)	859	939	800	850	782	805
Carcass wt. (cold)	497	534	456	485	451	475
Dressing % (cold)	57.85	56.86	57.00	57.05	57.60	60.88
Carcass wt./day of age	1.20	1.30	1.06	1.18	1.10	1.20
Carcass grade - quality	10.8	10.0	10.6	11.8	11.0	12.0
Carcass grade - yield (b)	1.7	1.4	1.5	1.8	1.8	1.8
Kidney fat % (b)	1.9	1.7	1.8	1.6	1.5	1.8
Ribeye area - actual (sq. ins.)	9.8	10.8	9.9	10.3	8.5	10.5
Ribeye area/100 lbs. carcass. (sq ins.)	1.98	2.02	2.17	2.12	1.91	2.21
Marbling	12.6	9.4	20.3	17.2	16.7	19.5
Shear (d)	31.70	27.29	28.00	19.98	20.10	27.96
Fat thickness over ribeye (mm) (c)	6.1	4.8	5.1	8.3	5.1	10.2

(a) Weighed at plant just before slaughter.
(b) Estimated by federal grader.
(c) Measured at three places and averaged.
(d) One inch core - Deep fat method of cooking.

3. Diseases and Injuries:

a. Anaplasmosis:

The first case of anaplasmosis was detected on September 4. Three cases were treated in September. Two of the animals died. An Angus cow was treated in October for a severe case of anaplasmosis with complete recovery. This cow later aborted an apparently normal fetus. In November, an Angus cow was found dead on pasture. Mortality was probably due to anaplasmosis.

b. Parainfluenza:

On November 16, a sudden outbreak of parainfluenza was diagnosed among the young bulls on feed test in two barns. Three bulls died and nine were treated and recovered. Two more bulls died from parainfluenza in December.

c. Johnes:

Two animals, bull and cow, both Angus were destroyed and posted by the veterinarian. It was diagnosed that the difficulty was probably due to Johnes.

d. Navel infections:

Several young calves, especially Brangus, were treated for infected navels. Infection seemed to occur more frequently in calves with pendulous sheaths.

e. Listeriosis:

A young Angus cow was sacrificed and posted by the veterinarian. She had injured herself severly before destruction. This cow had spells during which she would crash through woven wire fences and board fences. Her condition was diagnosed as a nervous disorder.

f. Disease Prevention:

All calves were vaccinated for black leg and malignant edema in the spring when the calves were about two months old and again in the fall at six months of age.

All cattle were inoculated against anthrax in May.

After the outbreak of parainfluenza among the bulls on feed, it was decided to vaccinate all cattle on feed against this dread disease.

All mature and young cattle were treated for internal parasites and liver flukes in the spring and the fall.

As soon as insects were noticed in spring, back scratchers were installed and treated in each pasture. They were treated periodically thereafter to control external parasites.

After all cattle were on feed test for 90 days, ammonium chloride was administered daily in the feed to prevent urinary calculi.

All replacements heifers were inoculated for brucellosis at eight months of age. The county in which the station is located weas certified as "Modified Bangs Free" in June 1967.

g. Injuries:

Three Angus bulls injured either their penis or sheath while in the breeding herd. Two of the bulls recovered after treatment. The third bull was treated for four months with no recovery and was sold for slaughter.

An Angus bull stuck a nail in his hind foot causing severe injury and infection to the bone in the toe. Treatment and recovery were slow and prolonged.

IV. Improvement of Facilities:

a. A new microscope was purchased.

b. Additional cross fences were constructed in the marsh adding four more pastures.

c. Seven new pens were built for sorting cattle into breeding herds.

d. Electricity was installed at pens at Annex for use of ultrasonic instrument.

e. A new calculating machine was purchased.

V. FUTURE PLANS

1. To follow plans of the project.

2. Improvements:

a. Build roof over working chute at Annex to permit its use during rain and inclement weather.

b. Construct fenced lanes from pastures at Annex to working pens for handling and moving cattle more efficiently and easier.

c. Build two small holding pens at strategic locations at Annex to prevent having to drive cattle across a busy highway and two railroads and also to keep from having to drive sick or injured animals long distance (1 - 1/4 miles).

d. Repair culvert bridges at Annex.

e. Continue to improve drainage.

f. Crown and seed marsh to suitable forages.

VI. PUBLICATIONS:

Reynolds, W. L., T. M. DeRouen, R. S. Temple and D. C. Meyerhoeffer. 1967. Winter feed and growth of Angus, Brahman and crossbred heifers. J. Ani. Sci. 26:888. (Abstract)

DeRouen, T. M., W. L. Reynolds, D. C. Meyerhoeffer, H. C. Gonsoulin and N. T. Poche'. 1967. Beef cattle research at the Iberia Livestock Experiment Station. Seventh Livestock Producers' Day report, Department of Animal Science, L.S.U. and Agricultural Experiment Station, Baton Rouge, La.

VII. PUBLICATIONS PLANNED:

1. Review of the old project.

2. Study of shrink in cattle.

Production, Inventory, and Performance Data, S-10 Herds - 1967-68

State Louisiana

Location		Jeanerette				
Breed of Sire		Brangus	Brangus	Angus	Angus	Angus
Breed of Dam		Brangus	Brangus	Angus	Angus	Angus
Line or group[1]		Hi fat	Lo fat	Hi fat	Lo fat	Local Adapt
Percent used in project		100	100	100	100	100
Inventory as of July 1, 1968	Cows 2 years and over	58	54	44	49	65
	Yearling heifers	12	22	24	24	11
	Bulls under 1 year	18	20	16	20	18
	Heifers under 1 year	22	18	12	14	16
	Bulls over 1 year	9	9	11	8	8
	Steers over 1 year	0	0	0	0	0
Repro. Perf.	Percent Pregnant[2]	81	71	68	80	86
	Calf survival percent[3]	95	96	95	97	96
Wean. Perf.	Adj. ADG[4]	1.83	1.78	1.61	1.64	1.63
	Av. type sc.[5]	9.4	9.4	10.3	10.4	11.5
Postweaning Performance	No. of bulls	11	14	5	7	8
	No. of heifers	0	0	0	0	0
	No. of steers	0	0	0	0	0
Slaughtered	No. of bulls	5	8	3	4	3
	No. of heifers	0	0	0	0	0
	No. of steers	0	0	0	0	0

Remarks: Data other than inventory is for performance in 1967
Angus cows in the outside were artificially bred.

1 - Purebreds, grade, line, sire number, crosses, treatment, etc
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments: sex of calf and age of dam.
5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1967-68

State Louisiana

Location		Jeanerette				
Breed of Sire		Angus				
Breed of Dam		Angus				
Line or Group[1]		Adapt. Outside				
Percent used in project		100				
Inventory as of July 1, 1968	Cows 2 years and over	34				
	Yearling heifers	6				
	Bulls under 1 year	10				
	Heifers under 1 year	9				
	Bulls over 1 year	0				
	Steers over 1 year	0				
Repro. Perf.	Percent Pregnant[2]	72				
	Calf survival percent[3]	100				
Wean. Perf.	Adj. ADG[4]	1.48				
	Av. type sc.[5]	12.6				
Postweaning Performance	No. of bulls	2				
	No. of heifers	0				
	No. of steers	0				
Slaughtered	No. of bulls	2				
	No. of heifers	0				
	No. of steers	0				
Remarks Angus cows in the outside were artificially bred.						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4.- Indicate adjustments: Sex of calf and age of dam.
5.- Suggest S-10 scoring system; indicate if different.

MISSISSIPPI STATE UNIVERSITY
Agricultural Experiment Station

I. PROJECT: Hatch 3-207-666

A Study to Determine the Breeding Worth of Inbred and Outbred Bulls from Various Sources.

II. OBJECTIVES:

To compare pre-and postweaning growth rates, market grades, carcass qualities, carcass grades, and maternal ability of the progenies of potentially superior sires selected from various sources.

III. PERSONNEL: C. E. Lindley, Fay Hagan and C. B. Shawver

IV. ACCOMPLISHMENTS DURING THE YEAR:

Weaning weights and grades were taken on calves from 6 lines of Angus cattle (inbred bulls from the Virginia Station), one outbred Angus group and one Charolais bull. Postweaning performance is being collected on the first 6 steer calves born in each line.

The preweaning data are given in the following table.

Line		% Cows Calving	% Calves Weaned	Av. Birth Date of Calves	Av. Birth Wt.	Adj. Av. Daily Gain	Adj. 210 Day Wt.	Wean. Grade
1	H[a]	87	78	3-9	57.9	1.69	355	11.0
	S[b]			3-19	63.9	1.95	410	11.6
2	H	78	70	2-22	60.6	1.74	365	11.1
	S			3-1	60.7	1.79	376	11.5
3	H	71	59	3-12	62.8	1.72	361	11.3
	S			3-11	67.3	1.92	403	11.7
4	H	85	70	3-14	57.5	1.80	378	11.5
	S			3-6	64.8	1.83	384	11.9
7	H	74	60	3-1	64.7	1.73	363	11.5
	S			3-19	61.0	1.88	395	11.3
8	H	58	58	2-26	61.3	1.73	363	11.2
	S			2-25	59.8	1.98	416	12.3
X[c]	H	68	48	2-27	56.6	1.50	315	11.0
				3-3	64.5	1.72	361	11.7

a-heifers
b-steers
c-outbred bulls. All other lines correspond to lines from the Virginia Station.

The post weaning data are presented in the following table.

Line		Daily Feed Intake	A.D.G.	Av. Ending Wt.	Feed per Pound Gain
1	a	22.5	1.40	580	9.7
	b		2.31 (265)[d]	788	
2	a	20.0	1.50	595	9.6
	b		2.07 (2.34)	773	
3	a	19.6	1.64	593	13.3
	b		1.75 (1.17)	743	
4	a	22.6	1.42	613	10.8
	b		2.12	795	
7	a	18.6	1.36	604	8.7
	b		2.14 (2.40)	788	
8	a	18.9	1.59	632	10.2
	b		2.21 (2.12)	828	
X[c]	a	22.1	1.31	577	10.6
	b		2.08 (2.09)	757	

a - Wintering period of 91 days
b - Full feed, 86 days
c - See previous table for explanation
d - Hereford X Angus steers sired by line bulls.

V. FUTURE PLANS:

For the next several years it is planned that the line testing project be continued cooperatively with the Virginia Station.

VI. PUBLICATIONS DURING THE YEAR:

Lindley, C. E., C. B. Shawver, L. J. Smithson, and C. D. Edgar. 1967. Crossbreeding for Beef Production. Livestock Day Report.

VII. PUBLICATIONS PLANNED:

Within the next year it is planned that all data be completely analyzed from which several papers are anticipated.

Production, Inventory, and Performance Data, S-10 Herds 1967-68

State Mississippi

Location		Prairie	Prairie	Prairie		
Breed of Sire		Angus	Hereford	Shorthorn		
Breed of Dam		Angus	Hereford	Shorthorn		
Line or Group[1]						
Percent used in project						
Inventory as of July 1, 1968	Cows 2 years and over	172	248	42		
	Yearling heifers	34	47	4		
	Bulls & Steers under 1 year					
	Heifers under 1 year					
	Bulls over 1 year	16	12	2		
	Steers over 1 year	36				
Repro. Perf.	Percent pregnant[2]	73.0	82.1	37.5		
	Calf survival percent[3]	94.9	94.5	86.6		
Wean. Perf.	Adj. ADG[4]	1.73	1.58	1.53		
	Av. type sc.[5]	11.66	10.12	10.27		
Postweaning Performance	No. of bulls					
	No. of heifers					
	No. of steers	36				
Slaughtered	No. of bulls					
	No. of heifers					
	No. of steers					
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:
5 - Suggest S-10 scoring system; indicate if different.

NORTH CAROLINA STATE UNIVERSITY
Agricultural Experiment Station
Raleigh, North Carolina

I. PROJECT: Animal Science 1010 (AH-d1-23 Rev. #2)

Genetic and Environmental Interactions for Performance and Carcass Traits in Beef Cattle

II. OBJECTIVES:

A. To evaluate the importance of sire-by-location interaction for performance traits.

B. To evaluate sire-by location and ration interaction for gain and carcass characteristics of steer progeny.

C. To develop and evaluate selection criteria for the improvement of productive efficiency and market quality.

III. PERSONNEL:

W. T. Ahlschwede, E. U. Dillard, J. E. Legates, O. W. Robison, J. A. Vesely and T. N. Blumer.

IV. ACCOMPLISHMENTS DURING THE YEAR:

Terminal groups of steers at the three location completed postweaning gain test and were slaughtered. Class means of these 73 steers are given in Table I for average daily gain and carcass grade. Sire-location class means are shown separately for steers finished on grass and concentrate.

Analyses of the steer performance data from the genotype-environment study are underway. Results, however, are not yet available. A general summary of the data is given in Table II. The means in Table II are pooled over sires at each location. The traits shown, average daily gain and carcass grade, were chosen for their widespread interest. Other traits being considered are preweaning gain, grade, early postweaning gain and carcass measurements.

Sixty-three bulls were performance tested at Raleigh and Plymouth. These bulls were individually fed. Sire-location means are given in Table III for adjusted 205-day weight, 365-day weight and pounds of feed per pound of gain. Clean-up bulls were used in 1966, and their progeny are listed under "others".

A new project proposal was developed during the year directed towards selection for preweaning and postweaning gain, with provision for measurement of milking performance as a correlated variable. It is anticipated that the new project outline can be made effective July 1, 1968. In connection with planning for this new project, a least squares analysis was conducted to determine the appropriateness of correcting postweaning bull performance for age of dam. Data from 189 bulls performance tested during the previous eight years were used in the analysis. Age of dam constants and analyses of variance were calculated for 205-day weight, 365-day weight, daily gain on test (some test periods extended beyond 365 days), and gain from 205 to 365 days. There was no indication of important age of dam effects for daily gain or gain from 205 to 365 days. Age of dam effects were larger, but not significant for 205 day weight and 365 day weight for these bulls. Estimates of the constants indicated that age of dam differences in 205-day weights were reflected in the 365-day weights, and that postweaning gain was not affected by age of dam in these data.

Estimates of milk consumption are being made monthly for all calves at Plymouth and Raleigh. Calves are suckled twice during the twenty-four hour test period. These estimates are being related to calf gain, and are providing indications of persistency.

V. FUTURE PLANS:

The new selection study project outline will be followed. Estimates of condition of weaning calves will be made using ultrasonic techniques. Pasture and winter feed deficiencies and parasite problems are being eliminated to allow heifers to be larger for breeding as yearlings. Management factors restricting weaning weight are being eliminated in the herds, in order that acceptable levels of performance can be achieved.

VI. PUBLICATIONS:

Koonce, Kennth Lowell. Associations of Birthweight and Gestation Length with Preweaning Growth in Beef Cattle. Ph.D. Thesis.

VII. PUBLICATIONS PLANNED:

Manuscripts directly concerned with genotype-environment study will be submitted. These will deal with preweaning performance, postweaning performance and carcass characteristics.

VIII. COOPERATING AGENCIES:

N. C. Department of Agriculture.

Table 1. Steer Performance at Three Locations in 1967.

Sire	Ration*	Plymouth			Raleigh			Laurel Springs		
		No.	ADG	Car. Grade	No.	ADG	Car. Grade	No.	ADG	Car. Grade
2002	C	6	1.9	11.0	3	2.1	10.3	4	2.6	10.5
	G	6	0.8	7.2	3	1.0	9.0	5	1.0	6.8
2630	C	5	1.9	11.8	3	2.1	11.7	5	2.1	11.6
	G	4	0.7	6.5	3	0.9	9.7	4	0.7	8.5
3039	C	3	1.9	10.7	3	2.4	10.3	5	2.3	10.7
	G	3	0.9	7.6	3	0.8	8.3	5	1.0	7.8

* C = Concentrate; G = Grass

Table II. Average Daily Gain and Carcass Grade for All Steers at Plymouth (P) Raleigh (R) and Laurel Springs (LS)

Year	Ration	Number			ADG			Car. Grade		
		P	R	LS	P	R	LS	P	R	LS
1961	C	5	7	8	1.8	2.0	2.0	9.0	10.1	11.0
	G	4	7	8	1.0	1.3	1.3	6.5	7.7	7.9
1962	C	11	9	12	2.1	1.9	2.2	11.4	12.0	11.4
	G	12	9	12	1.0	0.9	1.4	8.1	7.2	8.1
1963	C	10	7	9	1.9	2.1	2.3	11.3	10.1	11.2
	G	10	9	9	1.1	1.1	1.7	8.7	8.1	8.8
1964	C	10	9	9	2.2	1.5	2.3	11.3	10.1	11.6
	G	9	8	9	1.0	0.9	1.1	8.44	7.7	9.8
1965	C	12	8	14	2.0	2.3	2.6	10.6	10.8	11.9
	G	11	8	15	1.2	1.3	1.2	6.9	7.2	8.5
1966	C	14	9	14	1.9	2.2	2.3	11.2	10.8	11.0
	G	13	9	14	0.8	0.9	0.9	7.1	9.0	7.6
Total	C	177				2.1			11.1	
	G	178				1.1			8.0	

* C = Concentrate; G = Grass

Table III. Performance of 1967 Bulls at Raleigh and Plymouth

Sire No.	Location *	No. of bulls	Adj. 205 day wt.	365 day weight	Lb. feed per lb. gain
5712	R	4	434	829	5.33
	P	8	424	801	5.57
6310	R	4	386	769	5.59
	P	12	448	822	5.71
6637	R	4	397	749	5.42
	P	9	418	780	5.38
Others	R	16	416	755	6.07
	P	6	380	727	5.04

* R = Raleigh; P = Plymouth

Production, Inventory, and Performance Data, S-10 Herds 1967-68

State North Carolina

Location		Raleigh	Plymouth	Butner	Laurel Springs	
Breed of Sire		Hereford	Hereford	Hereford	Hereford	
Breed of Dam		"	"	"	"	
Line or Group[1]		Grade	Grade	Grade	Grade	
Percent used in project		100	100	100	100	
Inventory as of July 1, 1968	Cows 2 years and over	77	109			
	Yearling heifers	24	30			
	Bulls & Steers under 1 year	25	40			
	Heifers under 1 year	33	36			
	Bulls over 1 year	15	22			
	Steers over 1 year	0	0			
Repro. Perf.	Percent pregnant[2]	65	86			
	Calf survival percent[3]	91	95			
Wean. Perf.	Adj. ADG.[4]	1.65	1.72			
	Av. type sc.[5]	9.1	10.1			
Postweaning Performance	No. of bulls	28	35			
	No. of heifers	24	30			
	No. of steers		28	18	28	
Slaughtered	No. of bulls	11	13			
	No. of heifers					
	No. of steers		28	18	28	
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:
5 - Suggest S-10 scoring system; indicate if different.

CLEMSON UNIVERSITY
Agricultural Experiment Station
Clemson, South Carolina

I. PROJECT: SC-479 (S-10)

The Response of Sire Progenies to Management and Feeding Procedures

II. OBJECTIVES:

To investigate the response of sire progenies, as measured by live animal and carcass traits, to methods of producing slaughter cattle.

To evaluate the magnitude and importance of the average genotype with certain environmental influences.

To develop, through selection, herds of beef cattle with superior performance under South Carolina conditions.

III. PERSONNEL:

W. C. Godley, G. C. Skelly, Jr., R. M. Rauton, R. F. Wheeler.

IV. ACCOMPLISHMENTS DURING THE YEAR:

One hundred and eleven purebred Angus and 92 purebred Polled Hereford cows were put in the herd to produce the 1967 calf crop. One hundred and fifty-one of these cows produced calves. This was the lowest conception rate in several years. The percent calf crop varied by sire groups from 95 to 100. The fertility of two Herefords and one Angus bull was apparently very low. Seven of the 151 calves produced were born dead. This is considerably below that of the 1966 calf crop. Twenty-seven Angus and 18 Polled Hereford steers produced in the 1966 calf crop were fed on post weaning feeding tests. Comprehensive carcass information was obtained from these steers. Thirteen Angus and seven Polled Hereford bulls were fed on pasture on a 140-day ROP feeding trial. The cattle on this project at the Coast Experiment Station were moved to the Simpson Station, Clemson, South Carolina. This year will end the present project and a new one will be initiated.

Data on 449 cow-calf pairs from the purebred Angus and Polled Hereford herds at Clemson and the Coast Experiment Station, Summerville, South Carolina were analyzed to determine the relationship between the preweaning performance of the dams and the subsequent preweaning performance of their offspring.

Project - SC 479

Significant positive correlations were found in the Angus between dam's birth weight and offspring's birth weight and between dam's average daily gain to weaning and offspring's birth weight. Significant negative correlation were found between dam's average daily gain to weaning and offspring's weaning grade and between dam's adjusted average daily gain to weaning and offspring's weaning grade.

In the Herefords, a significant negative correlation was found between dam's weaning grade and offspring's adjusted average daily gain to weaning. Significant positive correlations were found between dam's average daily gain to weaning and offspring's birth weight, between dam's adjusted average daily gain to weaning and offspring's birth weight and between dam's adjusted average daily gain to weaning and offspring's adjusted average daily gain to weaning.

No negative realtionship was found between the preweaning growth rate of dams and the maternal environment subsequently provided by these dams in the University system herds. There is apparently, however, a negative realtion between the grade of the Hereford dams and the maternal environment they subsequently provide. Whether this relationship is genetic, or environmental, or a combination of the two is not presently known.

Data from 381 steer progeny of 31 purebred Angus and Polled Hereford sires at Clemson and the Coast Experiment Station, Summerville, South Carolina, were analyzed to determine if significant differences exist between sire groups with respect to postweaning average daily gain, weight per day of age, carcass grade, loin eye area, and Warner-Bratzler shear test values.

The steers were raised at these stations from 1958 to 1966. Weaning data were collected at the individual stations, but all steers were assembled at Clemson for postweaning trials and slaughter.

Significant differences were found between Angus sire groups for weight per day of age, carcass grade, and loin eye area. Significant differences were found between Polled Hereford sire groups for postweaning average daily gain, weight per day of age, carcass grade, and loin eye area. No other significant differences were found.

The coefficient of variation of the Warner-Bratzler shear test values was high for both breeds. While no statistical differences in postweaning average daily gain were found, certain sires are considered to be more desirable than others from an economical view point.

V. FUTURE PLANS:

The current project is being phased out and a new project initiated.

VI. PUBLICATIONS DURING THE YEAR:

None

VII. PUBLICATIONS PLANNED:

Technical bulletins:

(1) A comparison of the preweaning performance of dams and their offspring.

(2) An evaluation of herd sires based on the postweaning performance and several carcass traits of their steer progeny

Journal Article:

The effect of weight fluctuations of dams on the preweaning performance of their offspring.

Production, Inventory, and Performance Data, S-10 Herds - 1967-68

State South Carolina

Location		Clemson	Clemson			
Breed of Sire		Angus	Hereford			
Breed of Dam		Angus	Hereford			
Line or group[1]		Purebred	Purebred			
Percent used in project		100	100			
Inventory as of July 1, 1968	Cows 2 years and over	127	66			
	Yearling heifers	40	14			
	Bulls & Steers under 1 year	42	21			
	Heifers under 1 year	43	21			
	Bulls over 1 year	8	7			
	Steers over 1 year	0	0			
Repro. Perf.	Percent pregnant[2]	83.8	63.0			
	Calf survival percent[3]	93.8	87.9			
Wean. Perf.	Adj. ADG[4]	2.10	1.74			
	Av. type sc.[5]	13.7	12.2			
Postweaning Performance	No. of bulls	13	7			
	No. of heifers	40	14			
	No. of steers	30	19			
Slaughtered	No. of bulls	6	2			
	No. of heifers	0	0			
	No. of steers	30	19			
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:
5 - Suggest S-10 scoring system; indicate if different.

UNIVERSITY OF TENNESSEE
Agricultural Experiment Station
Knoxville, Tennessee

I. PROJECT: H-61 (S-10)

Improvement of Producing Ability of Beef Cattle.

II. OBJECTIVES:

(1) To evaluate systematic breeding procedures.

(2) To estimate genetic parameters and genetic environmental interactions of biological and economic traits.

(3) To develop and evaluate selection criteria and selection procedures.

(4) To determine the hereditary significance of recurring abnormalities.

III. PERSONNEL:

C. S. Hobbs, R. R. Shrode, W. L. Brown, J. A. Odom and J. H. Felts

IV. ACCOMPLISHMENTS DURING THE YEAR:

As in past years, data on birth weight and weights, type grades and condition scores at approximately 120-140 days of age and at weaning were recorded for all calves born in all beef cattle research herds of the Tennessee Agricultural Experiment Station. All these data will continue to be available for use where appropriate in various statistical studies even though the specific S-10 contributing herds are now considered to be only the Angus herd at the Plateau Experiment Station (PES) at Crossville and the Hereford herd at the Tobacco Experiment Station (TES) at Greenville.

In the PES and TES herds data on weights, type and condition were collected at the following approximate ages of the 1967 calves: 135 days, 190 days, 235 days, 295 days, and 400 days. These data included weights and condition scores on the cows, weights, type scores and condition scores on the calves plus scores on components of type, viz., length of body, length of leg, length of rump and loin, width, muscling and depth. In these two herds, weights only were recorded at ages intermediate between the post-weaning ages enumerated above, i.e., at 265 days, 325 days, and 375 days. The only analyses of these data completed to date are conventional ones in which multiple regression models were fitted including various combinations of the various pre-weaning and post-weaning variables as independent variables to predict variables recorded at the last age of observation. Of the models examined the one including birth weight, 135-day weight and condition, 190-day weight and condition, gain from 190 to 235 days, and 235-day weight and condition accounted for the most variation in average daily gain from birth to the last age of observation, yielding a squared multiple correlation coefficient of 0.529.

Analyses were completed for a dissertation research study on beef calf performance during the grazing season as related to changes in dam's weight and fatness as measured by somoscope and visual condition score. Correlation between somoscope measurement of fat thickness and subjective

condition score was approximately 0.7 in both spring and fall. Included in the study were all 155 cows who weaned calves in 1966 in the PES herd. In these data changes in dam's fat thickness accounted for a significant portion of the variation in calf condition at weaning, suggesting the possibility of successful adjustment of average daily gain for maternal effects by using a measure of fatness in the cow and calf.

V. FUTURE PLANS:

The same data as were collected in 1967 will be recorded for the 1968 calf crop in the PES and TES herds. In addition, tape measurements of distance from withers to last rib attachment, from last rib attachment to a line joining the hooks and from this line to a line joining the pins and heart girth will be recorded for all calves at each time that subjective type scores are recorded. Fat thickness will be measured on all calves at weaning, using a Branson Model 12 Sonoray.

VI. PUBLICATIONS DURING THE YEAR:

Neel, J. B., J. M. Anderson, C. S. Hobbs and J. A. Odom. 1967. The effect of initial winter condition and level of winter feeding on beef cow and calf performance. Tennessee Farm and Home Science. Prog. Rept. No. 63:14-17.

Sanders, W. L. 1968. Relationship between change in condition of beef cows during the pasture season and the weaning performance of their calves. (Abst.) Journ. An. Sci. 27:297.

VII. PUBLICATIONS PLANNED:

Butts, W. T., and C. S. Hobbs. Effects of inbreeding of cows and calves on calf performance in an inbred Angus herd. (Submitted to Journ. An. Sci.)

Jamison, H. M., H. J. Smith, C. S. Hobbs and L. L. Christian. Factors affecting intra-cow variation in performance of beef cattle. (Submitted to Journ. An. Sci.)

Sanders, W. L., *et al*. Beef calf performance during the grazing season as related to changes in dam's weight and fat thickness. (To be submitted to Journ. An. Sci.)

TENNESSEE AGRICULTURAL EXPERIMENT STATION

Preliminary Analyses of Data Collected on 1967 Calf Crop

Six successive sets of data were collected from 198 calves born during the months of January to May of 1967 at the Plateau Experiment Station at Crossville and the Tobacco Experiment Station at Greenville. All calves observed at Crossville were purebred Angus, while those at the Greenville Station were Polled Herefords. The average data-collecttion ages were 135, 190, 235, 295, 355 and 400 days. Calf weights, type scores and condition scores were recorded each time. Relative estimates of body length, depth and width, leg length and amount of muscling were recorded each time except at 135 days.

In an attempt to determine which of the preweaning data would be most useful in predicting postweaning and lifetime (400-day) average daily gain (ADG), various correlation coefficients were computed and various multiple regression models were fitted. These preliminary calculations were made on a within-sex, sire and station basis to eliminate these sources of variation.

Various results of interest from analyses completed to date are presented in the following tables.

TABLE I

CORRELATIONS OF CERTAIN PRE- AND POST WEANING VARIABLES

VARIABLE NAME	VARIABLE NUMBER 1	2	3	4	5	6	7	8	9	10
1. Birth weight	---	0.411**	0.134	0.368**	-0.028	0.305**	-0.027	-0.064	0.238**	0.281**
2. 135 day weight		-----	0.378**	0.877**	0.368**	0.829**	0.378**	0.066	0.166*	0.655**
3. 135 day condition			-----	0.312**	0.471**	0.272**	0.401**	-0.066	0.012	0.260**
4. 190 day weight				-----	0.383**	0.909**	0.375**	0.001	0.153	0.701**
5. 190 day condition					-----	0.385**	0.643**	0.061	-0.057	0.291**
6. 235 day weight						-----	0.435	0.413	0.078	0.678
7. 235 day condition							-----	0.199*	-0.070	0.299**
8. 190 - 235 day ADG								-----	-0.166*	0.074
9. Post-weaning ADG									-----	0.731**
10. Lifetime (400 day) ADG										------

* $(0.01 < P < 0.05)$

** $(P < 0.01)$

TABLE II

MULTIPLE REGRESSION EQUATION FOR PREDICTING

LIFETIME (400-Day) AVERAGE DAILY GAIN

MODEL NUMBER	VARIABLES[a]									
	a	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	R^2
1	1.1979	0.0006	0.0004	0.0006	-0.0062	-0.0011	0.0086	-0.0014	-0.3625	0.529**
2	1.1953	0.0004	0.0006		0.0014		0.0008			0.506**
3	0.9764	0.0003	0.0030	0.0028						0.429**
4	1.1984	0.0007			0.0026	0.0058				0.493**
5	1.2274	0.0018					0.0022	0.0037		0.467**
6	0.9872		0.0031	0.0027						0.429**
7	1.1423				0.0026	0.0046				0.492**
8	1.1330						0.0023	0.0008		0.460**

a = Y intercept
X_1 = Birth weight
X_2 = 135 day weight
X_3 = 135 day condition score
X_4 = 190 day weight
X_5 = 190 day condition score
X_6 = 235 day weight
X_7 = 235 day condition score
X_8 = 190 to 235 day ADG

** ($P < 0.01$)

Production, Inventory and Performance Data, S-10 Herds - 1967-68

State Tennessee

Location		TES	PES			
Breed of Sire		P-HERE	ANGUS			
Breed of Dam		P-HERE	ANGUS			
Line or group[1]			1	2	3	
Percent used in project		100	100	100	100	
Inventory as of July 1, 1968	Cows 2 years and over	62	40	101	93	
	Yearling heifers	14	11	15	20	
	Bulls & Steers under 1 year	29	20	32	33	
	Heifers under 1 year	26	19	37	36	
	Bulls over 1 year	15	8	34	39	
	Steers over 1 year					
Repro. Perf.	Percent pregnant[2]	96.8	78.3	91.9	89.5	
	Calf survival percent[3]	87.2	64.8	83.8	82.2	
Wean. Perf.	Adj. ADG[4]	1.75	1.90	2.03	2.00	
	Av. type sc.[5]	11.6	11.4	12.2	12.3	
Postweaning Performance	No. of bulls	20	8	34	39	
	No. of heifers	32	16	43	34	
	No. of steers					
Slaughtered	No. of bulls					
	No. of heifers					
	No. of steers					
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:
5 - Suggest S-10 scoring system; indicate if different.

TEXAS A and M UNIVERSITY
Agricultural Experiment Station
College Station, Texas

I. PROJECT: H-2102

Breeding Methods for Beef Cattle in the Southern Region.

II. OBJECTIVES:

To estimate genetic parameters and genetic-environmental interactions of biological and economic traits.

III. PERSONNEL:

N. M. Kieffer (leader) and T. C. Cartwright.

IV. ACCOMPLISHMENTS DURING THE YEAR:

Testicular tissue from 25 bulls of various breeds was examined for prophase I meiotic configurations. Six hundred cells were observed from cytological squash preparations of each bull. Diplonema and diakinesis cells were only rarely seen, whereas pachytene nuclei were always present in large numbers. The sex chromosome complex was present as a darkly stained, heteropyknotic body until diplonema. During diplonema, the complex disappeared and the end-to-end pairing of the X- and the Y- chromosome could be discerned. At diakinesis, the centromeral ends of the chromosomes appeared to orient themselves with the centrosomes even before the centrosomes reached the cell poles. According to classical definitions of the stages of prophase I, the centromeres should show no orientation toward the poles or any components of the poles until metaphase I. No pairing irregularities indicative of translocations, inversions, deletions or duplications were evident in any of the animals used in this study.

Metaphase chromosomes from peripheral blood cultures were examined from calves exhibiting the anomalies described below. In all cases, the chromosomes were morphologically similar to that of normal cattle.

Breed	No.	Description of Anomaly
Charolais Charolais-Hereford	2 1	All three calves exhibited the following gross features: The stifle joints were solidly flexed. The hock and fetlock joints were flexed but could be manipulated normally. All were as active as their conformation permitted and all had healthy appetites. Two of the calves had cleft palates.
Angus	1	Spastic paresis (left hind limb).
Charolais	2	Muscle hypertrophy (double muscling).
Angus	1	Two-headed.
Hereford	1	Snorter dwarf.

Peripheral blood leukocytes were cultured from four sets of heterosexual twins. The ratio of lymphocytes containing XX to XY chromosomes was determined for each twin set. Chromosomal DNA was labeled with tritiated thymidine and the replication patterns of the sex chromosomes relative to the autosomes was followed by autoradiography. Pre-radiographic photomicrographs were made of 50 male and female metaphase cells from each animal. These same cells were later evaluated for the amount of labeling of their chromosomes as revealed by autoradiographs. Regardless of whether the twin was a genetic female or male, XX cells had one X chromosome which began replication early in interphase while the other X was late replicating. The Y chromosome, which was late replicating in genetic males, appeared to replicate slightly earlier in genetic females.

V. FUTURE PLANS:

1 - The effect of age of mammalian eggs prior to fertilization on chromosomal aberrations will be investigated. Starting in the Fall of 1968, 12 ewes will be checked continuously for onset of estrus. Breeding will be allowed at varying intervals after ovulation has been estimated to have occurred. The fertilized egg will be removed at intervals after mating has occurred, i.e., four, eight, 12, 16 days, etc., cultured in vitro and cytologically examined as to the chromosome complement. Any abnormalities found will be related to age of egg at time of fertilization. This research will be cooperative with Baylor Medical School and the College of Veterinary Medicine, Texas A&M University.

2 - A number of ewes will be artificially inseminated with goat semen and checked for pregnancy 20-30 days later. If conception has occurred, the embryo will be removed, and tissue from the embryo cultured in vitro. The chromosomes will be labeled with H^3 thymidine to study DNA replication of chromosomes of the two different species residing in the same cell.

3 - Examination of abnormal domestic animals for chromosomal abnormalities will be continued. One-hundred and fifty County Agricultural Agents within a 250 mile radius of College Station have been asked to cooperate in locating abnormal animals. All animals reported will be checked for the relationship of the karyotype to the abnormality concerned.

4 - Studies of determination of sex by examination of cells in amniotic fluid will be started. In cooperation with the College of Veterinary Medicine, amniotic fluid will be withdrawn from cows at about the 16th week of pregnancy and the cells cultured in vitro. The chromosomes will be examined for the sex chromosome composition.

5 - Extranuclear genetics. Research on the characterization of beef and dairy breeds based on mitochondrial differentiation will be developed beyond the present exploratory stage. Examination of mitochondria will be expanded to include Hereford, Brahman, Charolais, Jersey, Brown Swiss and Santa Gertrudis and to determine differences in morphology, density and energy producing ability. Mitochondria differences between breeds will be related to differences in specific combining abilities of these breeds. Essentially the same program will be applied to individuals

within a breed. The purpose of the within breed comparison is to examine the relationship between mitochondria differences and differences in growth rate of individuals of the same breed. The study will include the relationship of age to mitochondrial activity and a comparison of such a relationship between breeds and the amount of variability within the population. (This study will be under the co-direction of Dr. Igor Sarkissian of the Life Sciences Institute, Texas A&M University.)

VI. PUBLICATIONS:

Kieffer, N. M. and T. C. Cartwright. 1967. Domestic cattle chromosomes *in vitro*. I. Analysis of diploid number and metaphase morphology. Beef Cattle Research in Texas. Texas Agri. Exp. Sta. Consolidated Progress Rpts. No. 2483-2500.

Kieffer, N. M. and T. C. Cartwright. 1968. Sex chromosome polymorphism in domestic cattle. J. Heredity 59:34-36.

Treadwell, M. A. 1968. Prophase I of Spermatocytogenesis in the Bull, Master's Thesis. Texas A&M University, College Station, Texas.

I. PROJECT: S-1547

Genetics of Qualitative Characters in Beef Cattle.

II. OBJECTIVES:

To estimate genetic parameters and genetic-environmental interactions of biological and economic traits.

III. PERSONNEL:

D. F. Weseli (leader) and T. C. Cartwright.

IV. ACCOMPLISHMENTS DURING THE YEAR:

Immunogenetics: During the past year most of the reagents necessary for use in the routine blood typing test have been manufactured. A total of 39 reagents are available. Also, 55 antisera have been produced since initiation of the program.

An initial study utilizing animals in the beef cattle herds at College Station, Lufkin, and McGregor has been completed. This study involves determination of gene frequencies of hemoglobins and transferrins and their association with production characteristics. This study will be continued in conjunction with red cell typing in these herds and plans have been made to expand to include animals at other stations where samples will be collected.

A project to determine milk protein polymorphism involving αs casein, β casein, α lactoglobulin, κ casein has been initiated. Indications are that variations are detectable in beef cattle breeds and that a simplified test can be developed for their detection. Work is continuing to determine the fundamental differences between beef and dairy cattle proteins from a biochemical standpoint.

V. FUTURE PLANS:

Immunogenetics: Reagent production and standardization will continue. Final standardization of red blood cell typing test is expected soon. Blood typing will be initiated. Typing of current animals in cooperating S-10 herds of Texas, Virginia, and Tennessee will begin and a schedule for continuing data collection for these cooperative projects will be developed. The data collected will include transferrin (β globulin) and hemoglobulin types, but not milk protein polymorphisms. The milk protein polymorphism study will be continued. Electrophoretic techniques will be expanded to include preliminary studies of other systemic proteins in beef cattle.

VI. PUBLICATIONS:

Parker, B. A. 1967. Association of transferrin and hemoglobin types to production traits of beef cattle. Ph.D. Dissertation, Texas A&M University.

Parker, B. A., D. F. Weseli, and T. C. Cartwright. 1967. Relationship of hemoglobin types to production traits in beef cattle. J. Animal Sci. 26:888. (Abstr.).

Caldwell, Jerry and D. F. Weseli. 1967. Amino acid analysis of beef cattle milk proteins. J. Animal Sci. 26:884. (Abstr.).

I. PROJECT: H-2101

Breeding Methods for Beef Cattle in the Southern Region.

II. OBJECTIVES:

To estimate genetic parameters and genetic-environmental interactions of biological and economic traits.

III. PERSONNEL:

T. C. Cartwright (leader), H. A. Fitzhugh, Jr., A. A. Melton and R. C. Thomas.

IV. ACCOMPLISHMENTS DURING THE YEAR:

Selection for growth rate has been proposed as an effective indirect method for genetic improvement of feed efficiency (gain/feed). This proposal was examined for individuals following the genetic size-age curve described by the equation $Y_t = M(1-e^{Kt})$, where Y_t is linear size at age t, M is mature size ($t = \infty$), K is the maturing index and the genetic correlation between M and K equaled -.9. Results derived from simulated data indicated that mass selection for growth rate over constant weight or age intervals would be expected to increase growth-rate and mature size, decrease rate of maturing but to have no effect on intrinsic feed efficiency. However, selection for growth rate while restricting change in mature size would be expected to increase growth rate, earliness of maturing, feed efficiency and/or appetite. These results complement information from an experiment in which postweaning feed intake of 87 Hereford steers by 17 sires was restricted to the amount which all contemporaries would consume. Preliminary analysis yielded a heritability estimate of 0.64 for 32-week gain indicating that significant genetic variation exists for feed efficiency independent of appetite. (The above results are from project 1359.)

Examination of sources of genetic and environmental variations for beef cattle weight-age curves and the relationships between performance traits of dam and progeny have continued. The Gompertz equation $W_t = W_0\, e^{A/\alpha(1-e^{-\alpha t})}$ where W_t is weight at age t, α is the rate at which asymptotic weight is approached and A is the initial proliferation rate of body mass, was fitted to weights taken at monthly intervals through the lifetime of 118 Hereford or Brahman-Hereford cows. Genetic, environmental and phenotypic correlations between A and α exceeded 0.93. Individuals approaching the heavier asymptotic weights were slower maturing than cows approaching lighter weights. Weight at the point of inflection was a direct function of asymptotic weight and did not appear to be affected by environment. Assuming that the point of inflection on this curve is associated with puberty, then the results support the hypothesis that it is weight constant rather than age constant.

In this study, the nutrients considered included TDN required to produce a heifer, to maintain her as a cow as well as for her production during gestation and lactation. The nutrients, other than milk, required by the

calf up to slaughter were also considered. The amount of nutrients was computed by using NRC recommended values for TDN and assuming that the average growth curves were representative of the various groups. Milk production estimates were obtained from work done by Riggs and coworkers which have been reported in previous years. The amount of milk assumed to be produced by Hereford cows provided enough TDN to entirely fulfill the requirements of their calves for one month while the TDN produced in milk by Hereford-Brahman cross-bred cows fulfilled the requirements of their calves for more than four months.

Slaughter cattle from different size parents should be slaughtered at different weights for optimum utilization of nutrients. The small type should be slaughtered at lighter weights. The total efficiency of TDN utilization varied among breeding groups and the optimum was reached at different ages and weights. The differences among breeding groups were due to a set of variables associated with each breed or cross. These variables were net calf crop at weaning (which includes percent of calves born and percent of mortality), milk production, cow price/calf price ratio, size of dam and rate of growth of calf. A relative value of the importance of each of these variables was determined by considering each separately for Hereford heifers. An increase of efficiency due to either increased fertility or decreased calf mortality was quite obvious. The increase of efficiency of TDN utilization is greater when fertility is increased a per-centile at a lower level than a percentile increase at a higher level.

An increase of milk production had a detrimental effect on efficiency of TDN utilization because only 53% of the TDN provided to the dam for production of milk is converted into TDN in milk. This sacrifice in efficiency is necessary in order to properly nourish the young calf. Just how long we can afford to give the calf the luxury of nature's best food served with tender, loving care and affection depends on forage conditions and alternate uses for converting the forage resources to a cash product. TDN efficiency could be increased by decreasing the amount of milk produced by dams within limits or by shortening this suckling period when considered simply on a basis of total TDN utilized. Another source of nutrients had to be available in order to replace the milk. This was taken into account. The decrease of efficiency due to an increase in milk production was not as important as a decrease due to low fertility or high mortality.

As the cow price/calf price ratio increased, efficiency increased. That is, as the salvage value of cows increased, less sacrifice of the cost of growing the cow was incurred.

In order to evaluate the effect of cow size, an average small cow was compared to an average large cow. In our data, these were about the 950 lb. level and about the 1250 lb. level. The total amount of TDN required to produce a pound of slaughter calf at weaning rather strongly favored the calf from the smaller cow. However, if the calves were slaughtered close to the maximum efficiency points, the total TDN required to produce a pound of live weight was slightly less from the calf of the larger cow. The point of maximum efficiency was reached at an age one month older for the calf from the large dam at a weight of approximately 1100 lb. compared to approximately 800 lb. for the calf from the smaller dam. The advantages and disadvantages of each tend to cancel,

setting broad limits of nearly equal suitability of cow size in a straightbred operation. Per head costs, which were not considered in this study, may become very important.

When a medium sized dam produced a large calf, the efficiency of TDN was better than when she produced a small calf. Mating medium size cows to both small bulls and large bulls would be required to get smaller calves and larger calves. The point of maximum efficiency was reached at 755 lb. for the small calf and 900 lb. for the heavier calf. When comparisons were made at the points of maximum efficiency, almost 1 more pound of TDN per pound of live weight was required for the small calf. The small calf required 800 lb. more TDN. Such a difference in efficiency may represent between $16 and $20 difference in the cost of producing one slaughter individual. This difference represents approximately 2.3¢ more per lb. to produce the smaller calf. This difference can be related simply to the choice of bull to which the cows are mated. That is, using high gaining sires vs. low gaining sires could make this difference.

An extension that could be applied to feedlot cattle is predicting the most efficient average time to slaughter. For example, cattle gaining 1.8 lb. per day at 10 mo. age should be slaughtered at 640 lb., cattle gaining 2.7 lb. per day should be slaughtered at 1000 lb., and cattle gaining 3.6 lb. per day should be slaughtered at 1360 lb. These slaughter weight estimates based on a steer/feed price ratio of 10, decrease as the ratio decreases and vice-versa.

Six methods of reducing weaning shock and feeding extra grain have been explored in conjunction with the project to produce 1000 lb. calves at 365 days of age. Four treatment groups were weaned at 8 months, one at 6 months and one at 4 months of age (table 1).

Table 1. Unadjusted Weight at 12 Months for each Preweaning Treatment

Preweaning treatment		No. of years	No. of animals	Wt. at 12 months
Control Dam's milk & grass, wean at 8 mo., self fed 4 mo.	Steers	7	62	929
	Bulls	2	20	1019
Creep Dam's milk & grass, wean at 8 mo., self fed 4 mo.-steers		3	23	917
Drylot Self feeder & dam's milk once per day, wean at 8 mo., self fed 4 mo.-steers		3	23	958
Dam's milk & grass Wean slowly at 8 mo.-allow calves to nurse overnight 7-14 days-self fed 4 mo.-steers		2	17	890
Wean at 6 mo.	Steers	1	13	892
Self fed 6 mo.-steers	Bull	2	5	883
Wean at 4 mo.	Steers	1	2	989
Self fed 8 mo.	Bulls	1	4	938

The highest 12-month weight was produced by bull calves on dam's milk and grass until 8 months of age, and then suddenly weaned and fed in drylot for 120 days on an 85% concentrate ration. All other treatments except the early weaning have been abandoned. The early weaned group was the next heaviest. Early weaning has shown promise as a management scheme to produce heavy and efficient animals at one year of age. More study will be made of the practice of early weaning to determine the ages of calves at which the nutrients consumed through feed become a major influence on the calf's gain. This will be determined by relating weekly TDN consumption from feed to gain versus the TDN consumption from milk. Data from Project 1583 will be used for this determination. At 30-day intervals around this age, calves of the same sire group and breeding will be weaned. Calves within each weaned-age group will be fed different levels of protein of different quality. In addition, all suitable crossbred calves which can be paired by sire and breeding will be used in a comparison of weaning at 6 and at 8 months of age. The crosses used were single crosses, first and second backcross and three breed crosses. These crosses consisted of Hereford, Santa Gertrudis, Brahman, Charolais, Charbray, Brown Swiss and Red Poll breeding. Table 2 shows the average weight at 12 months of age by year and by treatment groups in 1966 and 1967. Each year some of the steers weighed over 1,000 pounds at 12 months, but the average was over 900 lb. for five of the seven groups. Chilled carcass weight per day of age was taken from 75 steers in four of the seven years. Twenty percent of the steers had 1.50 pounds or more chilled carcass weight per day of age and twenty-five percent of the steers yielded 52 percent or over of boneless trimmed cuts.

Table 2. Average Weight of Calves at 12 Months by Years and Groups.

Year	1961	1962	1963	1964	1965	1966 (1)	1966 (2)	1967 (1)	1967 (2)
No. of animals	24	21	24	20	24	20	6	10	20
Range in weight	803-1022	840-1168	777-1192	814-1059	807-1015	810-1088	833-1022	770-1060	767-1205
Avg. weight	898	975	948	909	891	975	955	893	986

This work demonstrates that selection, crossbreeding, optimal season of calving, diethylstilbestrol implantation and drylot feeding immediately after weaning are congenial in application. Data show that the early weaned calves were a little heavier at 180 days and at one year of age. The rations fed were 65% milo, 10% oats, 10% cottonseed meal and 15% sorghum hay in 1966, and 40% milo, 10% cottonseed meal and 50% sorghum hay in 1967.

Responses from selection in a Brahman herd and a Hereford herd at the Livestock and Forage Research Center at McGregor, Texas were estimated from data collected since 1950. Records on 390 Brahman and 1450 Herefords were included in analyses to obtain least-squares constants for fixed sources of variation. Birth weight, weaning weight, average daily gain and weight per day of age

records were adjusted for environmental effects by use of the constants. Means and standard deviations were computed from the adjusted data for each sex and pooled to obtain overall estimates. Records of Brahman and records of Herefords eligible for registration were most suited for this study. The two groups of data were analyzed separately, but in a similar manner. Annual means were regressed on time expressed in years to obtain an estimate of average phenotypic change per year. Repeated matings from all breeds and crosses raised at the Research Center were used to estimate yearly environmental trends. The environmental difference between any two consecutive years was taken as the average differences between adjusted weights of calves produced by consecutive repeated matings. The regressions of means of differences in consecutive time periods yielded estimates of environmental trends. Generation intervals and annual selection differentials were computed in order to determine effective selection intensities and predict the genetic change expected under field conditions, based on selection intensities and assumptions regarding genetic parameters.

The phenotypic trends were zero or positive for all traits except Brahman and Hereford weaning weight. The environmental trend was positive for birth weight and negative for weaning weight and average daily gain. An environmental trend was not estimated for weight per day of age. The estimated annual genetic trends were 0.62 ± 0.61 lb., -0.02 ± 1.70 lb. and 0.04 ± 0.01 lb. for Brahman birth weight, weaning weight and average daily gain, respectively. The estimated genetic trends for Hereford traits, in the same order, were -0.22 ± 0.32 lb., 1.80 ± 2.14 lb. and 0.02 ± 0.00 lb. Standard errors of regression coefficients were relatively large, except in the case of postweaning traits. Average selection differentials were positive. Selection was most intense for average daily gain of bulls and weight per day of age of females. Weaning weight was given considerably more attention in the selection of Hereford bulls than in the selection of Brahman bulls. Selection differentials for postweaning traits of bulls were probably underestimated.

V. FUTURE PLANS

Continued work to characterize growth to maturity and correlated effects will be emphasized. Milk production maintenance requirements, optimum slaughter weights and optimum combination of breed characters are among the considerations more or less directly related to growth that are being considered. Comparisons of types which do not closely correspond to growth patterns of British breeds may begin during the year. These divergent types include Brahman and "double muscled" cattle. Emphasis on evaluating the potential of Jersey and Jersey-cross cows for efficiency of beef production will continue.

More study will be made of the practice of early weaning to determine the ages of calves at which the nutrients consumed through feed become a major influence on the calf's gain. This will be determined by relating weekly TDN consumption from feed to gain versus the TDN consumption from milk. Data from Project 1583 will be used for this determination. At 30-day intervals around this age, calves of the same sire group and breeding will be weaned. Calves within each weaned-age group will be fed different levels of protein of different quality. In addition, all suitable crossbred calves which can be paired by sire and breeding will be used in a comparison of weaning at 6 and at 8 months of age.

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Production, Inventory, and Performance Data, S-10 Herds - 1967-68

State Texas

Location		McGregor				
Breed of Sire		A	A	B	L	G
Breed of Dam		A	A	B	L	G
Line or Group[1]		Purebred	Grade	Purebred	Purebred	Purebred
Percent used in project		100	100	100	100	100
Inventory as of July 1, 1968	Cows 2 years and over	41	25	15	32	32
	Yearling heifers	7	6	3	5	5
	Bulls & Steers under 1 year	13		2	5	9
	Heifers under 1 year	23		6	5	11
	Bulls over 1 year	4		8	12	7
	Steers over 1 year					2
Repro. Perf.	Percent pregnant[2]	93	94	74	76	78
	Calf survival percent[3]	95	87	78	79	80
Wean. Perf.	Adj. ADG.[4]	2.0	2.0	2.1	2.7	2.3
	Av. type sc.[5]	None	None	None	None	None
Postweaning Performance	No. of bulls	11		4	11	10
	No. of heifers	10	7	6	7	12
	No. of steers		8	1		1
Slaughtered	No. of bulls					
	No. of heifers					
	No. of steers					
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:
5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1967-68

State Texas

Location	McGregor				
Breed of Sire	H	H	J	BS	A
Breed of Dam	H	H	J	BS	J
Line or Group [1]	Purebred	Grade	Purebred	Purebred	Grade
Percent used in project	100	100	100	100	100
Inventory as of July 1, 1968 — Cows 2 years and over	94	87	10		21
Inventory as of July 1, 1968 — Yearling heifers	16	10			13
Inventory as of July 1, 1968 — Bulls & Steers under 1 year	34	22	4		
Inventory as of July 1, 1968 — Heifers under 1 year	24	27	2		
Inventory as of July 1, 1968 — Bulls over 1 year	18			2	
Inventory as of July 1, 1968 — Steers over 1 year		12			
Repro. Perf. — Percent pregnant [2]	85	86			100
Repro. Perf. — Calf survival percent [3]	80	81			100
Wean. Perf. — Adj. ADG. [4]	2.1	2.0			1.7
Wean. Perf. — Av. type sc. [5]	None	None	None	None	None
Postweaning Performance — No. of bulls	13				
Postweaning Performance — No. of heifers	25	18			
Postweaning Performance — No. of steers		24			
Slaughtered — No. of bulls					
Slaughtered — No. of heifers		1			
Slaughtered — No. of steers		6			
Remarks					

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:
5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1967-68

State Texas

Location		McGregor					
Breed of Sire		A	B	B	B		
Breed of Dam		1X	4X	23X	24X		
Line or Group[1]		Grade	Grade	Grade	Grade		
Percent used in project		100	100	100	100		
Inventory as of July 1, 1968	Cows 2 years and over		6	5	4		
	Yearling heifers						
	Bulls & Steers under 1 year	1					
	Heifers under 1 year	2					
	Bulls over 1 year						
	Steers over 1 year						
Repro. Perf.	Percent pregnant[2]	100	82	86	87		
	Calf survival percent[3]	97	69	68	85		
Wean. Perf.	Adj. ADG.[4]			1.8	2.2		
	Av. type sc.[5]	None					
Postweaning Performance	No. of bulls						
	No. of heifers			2	2		
	No. of steers	2		1	1		
Slaughtered	No. of bulls						
	No. of heifers						
	No. of steers						
Remarks							

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments;
5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1967-68

State Texas

Location		McGregor				
Breed of Sire		L	L	L	L	L
Breedof Dam		105X	H	1X	A	66
Line or Group[1]		Grade				
Percent used in project		100	100	100	100	100
Inventory as of July 1, 1968	Cows 2 years and over		9	1		3
	Yearling heifers		3		4	
	Bulls & Steers under 1 year	1	7	2	6	
	Heifers under 1 year	1	5	7	5	1
	Bulls over 1 year					
	Steers over 1 year					
Repro. Perf.	Percent pregnant[2]	100	71	90	100	100
	Calf survival percent[3]	75	100	81	94	100
Wean. Perf.	Adj. ADG[4]		2.1	2.2	2.1	2.3
	Av. type sc.[5]	None				
Postweaning Performance	No. of bulls					
	No. of heifers		5	9	4	2
	No. of steers		4	1	3	3
Slaughtered	No. of bulls					
	No. of heifers					
	No. of steers					
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustements
5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1967-68

State Texas

Location		McGregor					
Breed of Sire		L	L	L	L	L	
Breed of Dam		15x	72x	76x	77x	16x	
Line or Group[1]		Grade	Grade	Grade	Grade	Grade	
Percent used in project		100	100	100	100	100	
Inventory as of July 1, 1968	Cows 2 years and over	4	1	6	2	7	
	Yearling heifers	1	1		1		
	Bulls & Steers under 1 year	2	1	3	2		
	Heifers under 1 year	2		5	1	5	
	Bulls over 1 year						
	Steers over 1 year						
Repro. Perf.	Percent pregnant[2]	100	100	83	50	86	
	Calf survival percent[3]	75	100	100	100	100	
Wean. Perf.	Adj. ADG[4]	2.3	2.0	2.0	2.2	2.3	
	Av. type sc.[5]	None					
Postweaning Performance	No. of bulls						
	No. of heifers	2	3	3	2		
	No. of steers		1		1		
Slaughtered	No. of bulls						
	No. of heifers						
	No. of steers						
Remarks							

1 - Purebreds, Grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments;
5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1967-68

State Texas

Location		McGregor					
Breed of Sire		L	G	G	G	G	
Breed of Dam		82X	H	11X	32X	13X	
Line or Group[1]		Grade	Grade	Grade	Grade	Grade	
Percent used in project		100	100	100	100	100	
Inventory as of July 1, 1968	Cows 2 years and over		5	7	6	4	
	Yearling heifers	2					
	Bulls & Steers Under 1 year	3			3	2	
	Heifers under 1 year	1			2		
	Bulls over 1 year						
	Steers over 1 year						
Repro. Perf.	Percent pregnant[2]	0		70	80	75	
	Calf survival percent[3]	0		75	75	100	
Wean. Perf.	Adj. ADG[4]	2.1		2.4	2.5	2.6	
	Av. type sc.[5]	None	None	None	None	None	
Postweaning Performance	No. of bulls						
	No. of heifers	2			1	4	
	No. of steers	1					
Slaughtered	No. of bulls						
	No. of heifers						
	No. of steers						
Remarks							

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:
5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1967-68

State Texas

Location		McGregor					
Breed of Sire		BS	BS	G	L	L	
Breed of Dam		H	1X	A	57X	58X	
Line or Group[1]		Grade	Grade	Grade	Grade	Grade	
Percent used in project		100	100	100	100	100	
Inventory as of July 1, 1968	Cows 2 years and over	9	32				
	Yearling heifers	5					
	Bulls & Steers under 1 year	5			5	2	
	Heifers under 1 year	10		1	7	1	
	Bulls over 1 year						
	Steers over 1 year						
Repro. Perf.	Percent pregnant[2]	86	92		90	50	
	Calf survival percent[3]	100	95		90	100	
Wean. Perf.	Adj. ADG[4]	2.2	2.3		2.4	2.1	
	Av. type sc.[5]	None	None				
Postweaning Performance	No. of bulls						
	No. of heifers	7	2		6	1	
	No. of steers	7	3		4	2	
Slaughtered	No. of bulls						
	No. of heifers						
	No. of steers						
Remarks							

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:
5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds 1967-68

State Texas

Location		McGregor					
Breed of Sire		G	G	G	G	H	
Breed of Dam		42X	51X	14X	62X	B	
Line or Group[1]		Grade	Grade	Grade	Grade	Grade	
Percent used in project		100	100	100	100	100	
Inventory as of July 1, 1968	Cows 2 years and over	3	2	4		2	
	Yearling heifers	2			1	5	
	Bulls & Steers under 1 year	2			3		
	Heifers under 1 year	3	2				
	Bulls over 1 year						
	Steers over 1 year						
Repro. Perf.	Percent pregnant[2]	67				50	
	Calf survival percent[3]	50				100	
Wean. Perf.	Adj. ADG[4]	2.1				2.2	
	Av. type sc.[5]	None					
Postweaning Performance	No. of bulls						
	No. of heifers				6	5	
	No. of steers				2		
Slaughtered	No. of bulls						
	No. of heifers						
	No. of steers						
Remarks							

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:
5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1967-68

State Texas

Location		McGregor					
Breed of Sire		H	BS	H	H	BS	
Breed of Dam		58X	32X	11X	57X	A	
Line or Group[1]		Grade	Grade	Grade	Grade	Grade	
Percent used in project		100	100	100	100	100	
Inventory as of July 1, 1968	Cows 2 years and over						
	Yearling heifers						
	Bulls & Steers under 1 year	2	3	3	5	4	
	Heifers under 1 year	2	1	2	12	4	
	Bulls over 1 year						
	Steers over 1 year						
Repro. Perf.	Percent pregnant[2]	100	100			100	
	Calf survival percent[3]	67	100			100	
Wean. Perf.	Adj. ADG[4]	2.0	2.3			1.8	
	Av. type sc.[5]	None					
Postweaning Performance	No. of bulls						
	No. of heifers				5	1	
	No. of steers	2	1				
Slaughtered	No. of bulls						
	No. of heifers						
	No. of steers						
Remarks							

1 - Purebreds, grade, line, sire number, crosses, treatments, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:
5 - Suggest S-10 scoring system; indicate if different.

CATTLE BREED & CROSS CODES

Breed or Cross	Dam Breeding	Sire Breeding	Progeny Breeding
A	Angus	Angus	Angus
B	Brahman	Brahman	Brahman
BA	Brangus	Brangus	5/8 A - 3/8 B
BM	Beefmaster	Beefmaster	S - H - B
BS	Brown Swiss	Brown Swiss	Brown Swiss
C	Charbray	Charbray or Charolais	3/4, 7/8 L - 1/4, 1/8 B
G	Santa Gertrudis	Santa Gertrudis	Santa Gertrudis
H	Hereford	Hereford	Hereford
I	Holstein	Holstein	Holstein
J	Jersey	Jersey	Jersey
L	Charolais	Charolais	Charolais
R	Red Poll	Red Poll	Red Poll
RA	Red Angus	Red Angus	Red Angus
RB	Red Brangus	Red Brangus	Red Brangus
S	Shorthorn	Shorthorn	Shorthorn
U	Sussex	Sussex	Sussex
1x	Hereford	Brahman	1/2 H - 1/2 B
2x	Brahman	Hereford	1/2 B - 1/2 H
3x	1x & 2x	Hereford	3/4 H - 1/4 B
4x	1x	Brahman	3/4 B - 1/4 H
5x	3x & 9x	Hereford	7/8 H - 1/8 B
6x	Angus breeding, predominate		
7x	Brahman	1x & 2x	3/4 B - 1/4 H

*1 = E - Elig. for registration.
*2 = N - Not eligible for registration or record only in the association.
*3 = O - Horns.
*4 = P - Polled.

8x	4x & 23x	Hereford	5/8 H - 3/8 B
9x	Hereford	1x & 2x	3/4 H - 1/4 B
10x	3x,5x & 9x	Charolais	5/8 L - 3/8 H
11x	Hereford	Santa Gertrudis	1/2 H - 1/2 G
12x	Hereford	Red Poll	1/2 H - 1/2 R
13x	1x	Santa Gertrudis	1/2 G - 1/4 H - 1/4 B
14x	1x	Red Poll	1/2 RP - 1/4 H - 1/4 B
15x	Hereford	Charolais	1/2 H - 1/2 L
16x	1x & 2x	Charolais	1/2 L - 1/4 H - 1/4 B
17x	Charbray	Hereford	1/2 C - 1/2 H
18x	Santa Gertrudis breeding predominate		?
19x	Brahman breeding, predominate		?
20x	Charolais or Charbray breeding, predominate		?
21x	1x	1x & 2x	1/2 H - 1/2 B (inter se)
22x			
23x	4x	Brahman	7/8 B - 1/8 H
24x	23x	Brahman	15/16 B - 1/16 H
25x	24x	Brahman	31/32 B - 1/32 H
26x	Hereford	Charbray	1/2 H - 7/16 L - 1/16 B

Breed or Cross	Dam Breeding	Sire Breeding	Progeny Breeding
27x	26x	Charolais	3/5 L - 1/4 H
28x	27x	Charolais	7/8 L - 1/8 H
29x	28x	Charolais	15/16 L - 1/16 H
30x			
31x			
32x	11x	Santa Gertrudis	3/4 G - 1/4 H
33x	32x	Santa Gertrudis	7/8 G - 1/8 H
34x	33x	Santa Gertrudis	15/16 G - 1/16 H
35x			
36x	Brahman	Charbray	9/16 B - 7/16 L
37x	36x	Charolais	3/4 L - 1/4 B
38x	37x	Charolais	7/8 L - 1/8 B
39x	38x	Charolais	15/16 L - 1/16 B
40x			
41x			
42x	13x	Santa Gertrudis	3/4 G - 1/8 H - 1/8 B
43x	42x	Santa Gertrudis	7/8 G - 1/16 H - 1/16 B
44x	43x	Santa Gertrudis	15/16 G - 1/32 H - 1/32 B
45x	58x	Hereford	3/4 H - 1/4 BS
46x	58x	Brown Swiss	3/4 BS - 1/4 H
47x	10x	Charolais	13/16 L - 3/16 H
48x	47x	Charolais	29/32 L - 3/32 H
49x			
50x			
51x	Red Poll	Santa Gertrudis	1/2 R - 1/2 G
52x	51x	Santa Gertrudis	3/4 G - 1/4 R
53x	52x	Santa Gertrudis	7/8 G - 1/8 R
54x	53x	Santa Gertrudis	15/16 G - 1/16 R
55x			
56x	B	Brown Swiss	1/2 B - 1/2 BS
57x	1x	Brown Swiss	1/2 BS - 1/4 H - 1/4 B
58x	H	Brown Swiss	1/2 BS - 1/2 H
59x	57x	Hereford	1/4 BS - 5/8 H - 1/8 B
60x	57x	Brown Swiss	3/4 BS - 1/8 H - 1/8 B
61x	14x	Santa Gertrudis	1/2 G - 1/4 R - 1/8 H - 1/8 B
62x	61x	Santa Gertrudis	3/4 G - 1/8 R - 1/16 H - 1/16 B
63x	62x	Santa Gertrudis	7/8 G - 1/16 R - 1/32 H- 1/32 B
64x	63x	Santa Gertrudis	15/16 G - 1/32 R - 1/64 H- 1/64 B
65x			
66x	1x & 2 x	Charbray	7/16 L - 1/4 H - 5/16 B
67x	66x	Charolais	3/4 L - 1/8 H - 1/8 B
68x	67x	Charolais	7/8 L - 1/16 H - 1/16 B
69x	68x	Charolais	15/16 L - 1/32 H - 1/32 B
70x			
71x	15x	Charbray	11/16 L - 1/4 H - 1/16 B
72x	15x	Charolais	3/4 L - 1/4 H

Breed or Cross	Dam Breeding	Sire Breeding	Progeny Breeding
73x	72x	Charolais	7/8 L - 1/8 H
74x	73x	Charolais	15/16 L - 1/16 H
75x			
76x	3x, 5x, & 9x	Charbray	7/16 L - 3/8 H - 3/16 B
77x	76x	Charolais	3/4 L - 3/16 H - 1/16 B
78x	77x	Charolais	7/8 L - 3/32 H - 1/32 B
79x	78x	Charolais	15/16 L - 3/64 H - 1/64 B
80x			
81x	16x	Charbray	15/32 L - 1/4 H - 9/32 B
82x	16x	Charolais	3/4 L - 1/8 H - 1/8 B
83x	82x	Charolais	7/8 L - 1/16 H - 1/16 B
84x	83x	Charolais	15/16 L - 1/32 H - 1/32 B
85x			
86x	13x	Charbray	7/16 L - 1/4 G - 1/8 H - 3/16 B
87x	86x	Charolais	3/4 L - 1/8 G - 1/32 H - 3/64 B
88x	87x	Charolais	7/8 L - 1/16 B - 1/64 H - 3/64 B
89x	88x	Charolais	15/16 L - 1/32 G - 1/128 H - 3/128 B
90x	89x	Charolais	
91x	Brahman	Charolais	1/2 L - 1/2 B
92x	91x	Charolais	3/4 L - 1/4 B (Charbray)
93x	92x	Charolais	7/8 L - 1/8 B (Charbray)
94x	93x	Charolais	15/16 L - 1/16 B
95x	Coop. cattle		5/8 L - 1/4 B - 1/8 X
96x	Coop. cattle		1/4 R - 1/4 B - 1/8 H - 1/8 J
97x	Coop. cattle		3/4 H - 1/4 B (approx.
98x	Coop. cattle		R - B
99x	Coop. cattle		B - J
100x			
101x			
102x			
103x			
104x			
105x			
106x			
107x			
108x			
109x			
110x			
111x			
112x			
113x			

VIRGINIA POLYTECHNIC INSTITUTE
Animal Science Department
Blacksburg, Virginia

I. PROJECT: Hatch 345011. Line Project No. AH d1-7 (Rev. # 2)
Heterosis from Crosses among British Breeds of Beef Cattle.

II. OBJECTIVES:

To measure heterosis obtained from crosses among the Angus, Hereford, and Shorthorn breeds, as shown by growth rate, fattening ability, and carcass quality.

To measure productive ability of crossbred versus purebred dams.

III. PERSONNEL:

J. A. Gaines, W. H. McClure, R. C. Carter, G. W. Litton, and F. S. McClaugherty.

IV. ACCOMPLISHMENTS DURING THE YEAR:

The fifth calf crop in phase two was born approximately January to April of 1967, and weaned in October of 1967. After an adjustment period, the calves were put on full feed in groups in dry lot on fattening rations.

This year's report will be a summary of phase two to date, in order to render a more comprehensive report that may be a source of information to other entities.

The objective of phase two of this experiment is to compare the productivity of purebred and crossbred cows in terms of percentage calf crop born and weaned, birth and weaning weights of the calves, as well as their post-weaning performance. The cow herd, consisting of sixty purebreds (Angus, Hereford, and Shorthorn), and sixty crossbreds (reciprocal two-breed crosses) among these three breeds, was purchased as calves in 1960. Contracts were made with six breeders to mate a random one-half of each herd to a bull of a different breed and half to a bull of the same breed. Thus both purebred and crossbred heifers came from each of six herds.

The heifers were bred first, as two-year-olds, in 1962. Six bulls were used the first year; twelve bulls were used the second, third, fourth, and fifth years. Bulls used (and changed) each year were two purebreds of each of the Angus, Hereford, and Shorthorn breeds, and two crossbreds of each of the crosses Angus x Hereford, Angus x Shorthorn, and Hereford x Shorthorn (or the reciprocals). The crossbred bulls were bred to the purebred cows and the purebred bulls were bred to the crossbred cows. Thus all calves were either three-breed or backcrosses. All bull calves were castrated soon after birth.

This report is based on results from five calf crops. The total number of matings involved is 587. The average birth date of 273 calves from purebred dams was 18 Feb.; it was 15 Feb. for 279 calves from crossbred

dams (Table 1). Bull calves from purebred dams weighed 72 lbs. at birth; those from crossbred dams weighed 75 lbs. Heifer calves from purebred dams weighed 69 lbs. at birth; those from crossbred dams weighed 71 lbs. From 294 matings of purebred cows 92.9% calved and 88.4% weaned calves; from 292 matings of crossbred cows 95.5% calved and 89.0% weaned calves (Tables 2 and 3).

Steers (142 in no.) from purebred dams weighed 447 lbs. at weaning; 137 steers from crossbred dams weighed 460 lbs. 121 heifers from purebred dams weighed 426 lbs. at weaning; 125 from crossbred dams weighed 449 lbs. (Table 4). Feeder grade at weaning was choice minus for all groups (Table 5).

With respect to post-weaning performance, 126 steers from purebred dams gained 2.13 lbs./day on full feed, graded choice minus alive before slaughter, and graded choice in the carcass. The slaughter weight of these steers was 920 lbs., the carcass weight was 547 lbs., and the dressing percent was 59.8. The 120 steers from crossbred dams gained 2.16 lbs./day on feed and graded choice minus before slaughter and in the carcass; their slaughter weight was 945 lbs., carcass weight was 563 lbs., and dressing percent was 59.7 (Tables 6 and 8).

The 115 heifers from purebred dams gained 1.87 lbs./day feed and graded choice minus before slaughter and in the carcass; their salughter weight was 761 lbs., carcass weight was 451 lbs., and dressing percent was 59.0. The 115 heifers from crossbred dams gained 1.86 lbs./day on feed and graded choice minus before slaughter and in the carcass; their slaughter weight was 780 lbs., carcass weight was 464 lbs., and dressing percent was 59.5 (Tables 7 and 9).

Tentative conclusions at this time are: (1) no difference between purebred and crossbred cows in percent calves weaned (when the calves are crossbred), (2) weaning weights of steer calves were 13 lbs., and those of heifer calves were 23 lbs. in favor of crossbred dams, (3) steer calves from crossbred dams weighed 25 lbs. more at time of slaughter and had heavier carcasses by 16 lbs., compared to steers from purebred dams, (4) heifer calves from crossbred dams weighed 19 lbs. more at slaughter and had heavier carcasses by 13 lbs., compared to heifer calves from purebred dams.

V. FUTURE PLANS:

The field work of phase two has been completed. The data will be analyzed and published. Contract matings are being made at this time to produce females for the phase three cow herd.

VI. PUBLICATIONS DURING THE YEAR:

Gaines, J. A., G. V. Richardson, W. H. McClure, D. W. Vogt and R. C. Carter. 1967. Heterosis from crosses among British breeds of beef cattle: carcass characteristics. J. Animal Sci. 26:1217-1225.

TABLE 1. Birth Dates and Weights

Breeding of Dams	No. of Calves	Av. Birth Date	Av. Birth Weight Males	Females
Purebred	273	18 Feb.	72 lbs.	69 lbs.
Crossbred	279	15 Feb.	75 lbs.	71 lbs.

TABLE 2. Matings, Calves Born and Calves Alive At 36 Hours

Breeding of Dams	Matings	Calves Born No.	%	Alive at 36 Hours
Purebred	294	273	92.9	271
Crossbred	292	279	95.5	274
Difference		6	2.6	3

TABLE 3. Calves Weaned of Cows Mated

Breeding of Dams	Matings	Calves Weaned	Calves Weaned of Cows Mated, %
Purebred	293	259	88.4
Crossbred	291	259	89.0

TABLE 4. Ages and Weaning Weights

Breeding of Dams	Av. Age of Weaning	Weaning Weight Steers	Heifers
Purebred	232 days	447 lbs.	426 lbs.
Crossbred	234 days	460 lbs.	449 lbs.

TABLE 5. Feeder Grade at Weaning

Breeding of Dams	Feeder Grade	
	Steers	Heifers
Purebred	11.8	12.0
Crossbred	12.1	12.1

Grade Code: Choice Minus, 12; Good Plus, 11.

TABLE 6. Post-Weaning Data on Steers

Breeding of Dams	No. Fed	Daily Gain, lb.	Slau. Grade	Carcass Grade
Purebred	126	2.13	12.2	12.7
Crossbred	120	2.16	12.3	12.0

Grade Code: Choice, 13; Choice Minus, 12.

TABLE 7. Post-Weaning Data on Heifers

Breeding of Dams	No. Fed	Daily Gain, lb.	Slau. Grade	Carcass Grade
Purebred	115	1.87	12.0	11.8
Crossbred	115	1.86	12.2	11.7

Grade Code: Choice Minus, 12; Good Plus, 11.

TABLE 8. Post-Weaning on Steers

Breeding of Dams	No. Fed.	Slaughter Weight, lbs.	Carcass Weight, lb.	Dressing Percent
Purebred	126	920	547	59.8
Crossbred	120	945	563	59.7

TABLE 9. Post-Weaning Data on Heifers

Breeding of Dams	No. Fed	Slaughter Weight, lbs.	Carcass Weight, lbs.	Dressing Percent
Purebred	115	761	451	59.0
Crossbred	115	780	464	59.5

VIRGINIA POLYTECHNIC INSTITUTE
Department of Animal Science

I. PROJECT: S-031-8(S-10)

Evaluation of the Effectiveness of Selection for Economic Traits in Beef Cattle.

II. OBJECTIVES:

To obtain estimates of genetic parameters from field data to include:

(a) heritability and repeatability of traits
(b) phenotypic and genetic correlations
(c) construction of selection indexes

To study the factors influencing performance and sale price of ROP bulls, and

To evaluate the effectiveness of selection on the improvement of beef cattle under farm conditions.

III. PERSONNEL:

T. J. Marlowe, G. A. Waugh and D. W. Vogt.

IV. ACCOMPLISHMENTS DURING THE YEAR:

Completed the study on factors affecting the sale price of Culpeper ROP tested bulls.

The third calf crop (under the last objective above) of approximately 50 calves is on the ground and approximately 120 cows are rebred to 12 Culpeper ROP Hereford bulls. This will be the last calf crop in the initial comparison of the contemporary progenies of two groups of Culpeper ROP Hereford bulls with birth dates differing by five or more years. Approximately 200 Angus cows were bred in the Fleetwood Farm Herd at Delaplane with semen from 20 Culpeper ROP Angus bulls for a similar comparison to that conducted for Herefords.

Preliminary comparisons of the first 110 contemporary progenies from 18 ROP Hereford bulls (9 old, 9 young) indicate that the offspring of the younger bulls grew .038 lb. faster and weighed approximately 10 lbs. heavier at weaning than offspring of the older bulls.

In an attempt to find out how the bulls that were performance tested and sold at Culpeper by the Virginia BCIA have performed for their new owners, three approaches were taken: (1) a survey letter was sent in

1965 to all previous buyers of Culpeper bulls, (2) personal contacts were made with the owner or manager on 85 farms, and (3) the performance of 1,311 progeny of 33 Culpeper tested bulls was compated with the performance of 2,362 progeny of 79 other bulls in 26 BCIA herds over a 1 to 5 year period. All comparisons were within the same herd and year. The responses obtained from the survey and farm visits indicate that the Culpeper bulls have been well received and performed well in most cases. The comparison of progeny performance showed that the Culpeper bulls were favored in about 68% of the comparisons when growth was compared and 52 to 59% when grade was compared. The average differences in 205-day weight was 9 to 15 pounds but there was essentially no difference in weaning grade.

The environmental factors of herd, year, age of dam, month of birth, age of animal, and pre- and postweaning management practice were studied on 1,402 Angus bulls, 2,217 Angus heifers, 1,289 Hereford bulls and 1,402 Hereford heifers to determine their effects on growth rate and grade of yearling cattle. All of these factors had a significant effect on growth of Angus yearling cattle except month of birth and preweaning management and all except month of birth on Hereford yearling cattle. The effect of these factors on yearling grade was considerably less; however, some of the differences were statistically significant. Even so, only a few of the differences were large enough to have any practical significance. The number of observations, unadjusted means, and the partial regression coefficients for all significant effects except herd and year are shown in Table 1 for Angus yearlings and in Table 2 for Hereford yearlings.

V. FUTURE PLANS:

Calves will be obtained from the spring breeding in the Whitethorne Herd, after which the herd will be used in another project. At least one more calf crop will be obtained from 300-400 Angus cows in the Fleetwood Farm Herd in order to compare contemporary progenies from more young and old Angus bulls that have gone through the Culpeper ROP tests. This phase of the research will then be discontinued for three or four years, at which time semen will be collected from another group of young bulls and compared with bulls out of the same herds that went through the early tests.

VI. PUBLICATIONS DURING THE YEAR:

Schalles, R. R. and T. J. Marlowe. 1967. Factors affecting test performance of beef bulls. J. Animal Sci. 26:21-26.

Schalles, R. R., T. J. Marlowe and D. W. Vogt. 1967. Two methods of partitioning phenotypic change. J. Animal Sci. 26:889 (abstract).

Waugh, Gary A. 1968. Environmental factors affecting continuous growth and yearling type in beef cattle. M.S. Thesis, Virginia Polytechnic Institute.

VII. PUBLICATIONS PLANNED:

Marlowe, T. J. 1968. Bull selection criteria as indicated by sale price. J. Animal Sci. (in press).

Waugh, G. A. and T. J. Marlowe. 1968. Environmental influences on growth rate and grade of yearling beef cattle.

TABLE 1. EFFECTS OF AGE OF DAM, AGE OF ANIMAL, AND POSTWEANING MANAGEMENT PRACTICE ON ADG AND GRADE OF ANGUS BULLS AND HEIFERS

Effect	Number of Observations	Unadjusted Means[2] ADG	Grade	Pert. Reg. Coefficients[3] ADG	Grade
		Bulls			
Age of Dam in years					
2	153	1.92	12.8	-.11[a]	-.03[a]
3-5	612	2.02	12.9	-.04[b]	0.11[a]
6-14[1]	733	2.06	12.8	0.00[c]	0.00[a]
Age of Animal in months					
10-13[1]	1045	2.06	12.8	0.00[a]	0.00[a]
14	200	2.02	13.0	-.05[b]	0.05[a]
15	115	2.00	13.0	-.11[c]	-.02[a]
16	68	1.92	13.1	-.14[c,d]	0.07[a]
17-19	70	1.78	13.0	-.19[d]	0.17[a]
Postweaning Management Practice					
Full Fed[1]	1164	2.07	12.8	0.00[a]	0.00[a]
Limited-Fed	334	1.91	12.9	-.04[b]	-.18[a]
		Heifers			
Age of Dam in years					
2,3	654	1.30	12.0	-.06[a]	-.12[a]
4,5	579	1.33	12.1	-.01[b]	0.06[b]
6-11[1]	876	1.35	12.2	0.00[b]	0.00[b,c]
12-15	108	1.29	11.9	-.05[c]	-.42[c]
Age of Animal in months					
10-13[1]	1271	1.42	12.1	0.00[a]	0.00[a]
14	251	1.29	11.8	-.06[b]	-.14[a]
15,16	281	1.22	12.2	-.16[c]	0.15[a]
17-19	414	1.14	12.3	-.26[d]	0.11[a]
Postweaning Management Practice					
Full Fed[1]	140	1.54	13.3	0.00[a]	0.00[a]
Limited-Fed	966	1.41	12.0	-.12[b]	-.63[b]
No Grain	1111	1.23	12.1	-.15[c]	-.63[b]

[1]Selected base
[2]Fancy = 15 to 17, Choice = 12 to 14, Good = 9 to 11, etc.
[3]Values with different superscripts are significantly different ($P < .05$).

TABLE 2. EFFECTS OF AGE OF DAM, AGE OF ANIMAL, AND PRE- AND POSTWEANING MANAGEMENT PRACTICES ON ADG AND GRADE OF HEREFORD BULLS AND HEIFERS

Effect	Number of Observations	Unadjust. Means ADG	Unadjust. Means Grade[2]	Part. Reg. Coefficients[3] ADG	Part. Reg. Coefficients[3] Grade
Bulls					
Age of Dam in years					
2,3	328	2.00	12.8	-.10[a]	-.03[a]
4,5	387	2.10	12.9	-.02[b]	0.12[a]
6-14[1]	574	2.13	12.9	0.00[b]	0.00[a]
Age of calf in months					
10-12[1]	660	2.12	12.8	0.00[a]	0.00[a]
13-14	421	2.09	12.9	-.04[a]	0.04[a,b]
15-19	208	1.98	13.0	-.14[c]	0.10[b]
Preweaning Management					
Creep Fed	793	2.12	13.1	0.12[a]	0.16[a]
Non Creep Fed[1]	496	2.03	12.6	0.00[b]	0.00[a]
Postweaning Management					
Full Fed[1]	1041	2.12	12.9	0.00[a]	0.00[a]
Limited Fed	248	1.96	12.8	-.12[b]	-.26[a]
Heifers					
Age of Dam in years					
2,3	334	1.30	11.7	-.05[a]	-.08[a]
4-6	587	1.31	11.6	-.03[a]	-.07[a]
7-10[1]	383	1.31	11.6	0.00[b]	0.00[a]
11-14	98	1.30	11.3	-.04[a]	-.40[a]
Age of Animal in months					
10[1]	254	1.42	12.0	0.00[a]	0.00[a]
11-15	657	1.37	11.6	-.02[a]	0.00[a]
16-18	293	1.17	11.3	-.08[a]	-.09[a]
19	198	1.14	11.3	-.10[b]	-.11[a]
Preweaning Management					
Creep Fed	168	1.55	13.0	0.06[a]	0.26[a]
Non Creep Fed[1]	1234	1.27	11.4	0.00[b]	0.00[a]
Postweaning Management					
Full Feed[1]	59	1.65	12.5	0.00[a]	0.00[a]
Limited Fed	559	1.41	11.7	-.09[b]	-.22[a]
No Grain	784	1.21	11.5	-.24[c]	-.28[a]

[1]Selected base

[2]Fancy = 15 to 17, Choice = 12 to 14, Good = 9 to 11, etc.

[3]Values with different superscripts are significantly different ($P<.05$)

Table 3. Average calving dates[a,b/] in 1967 by breed, mating system, and 1965-66 winter silage. Beef Cattle Research Station, F. R., Va.

Winter silage	Angus		Hereford		Shorthorn				
	Inb'd	Sel'n	Inb'd	Sel'n	Inb'd	Sel'n	Inb'd	Sel'n	Ave.
Grass	77.8	77.0	95.7	90.9	93.3	86.8	90.0	85.8	87.7
Corn	83.8	79.7	90.1	84.5	91.0	85.2	87.8	83.9	85.9
Pomace	87.4	84.5	94.2	86.1	96.0	85.8	91.7	85.7	88.2
Average	82.0	79.1	94.4	88.6	93.6	86.2	90.0	85.5	87.6

a/ Calendar dates coded so that 25 March = 84, 26 March = 85, etc.

b/ N = 243 cows in 1965-66 study, bred in 1966, and calved in 1967.

Table 4. Analysis of variance for effects of breed, mating system, and 1965-66 winter feeding on 1967 calving date. Beef Cattle Research Station, Front Royal, Va.

Source	df.	Mean square	F
Treatments, T	2	62	0.3
Breeds, B	2	2,488	11.0**
Mating system, M	1	1,238	5.4*
B x T	4	396	1.7
B x M	2	322	1.4
T x M	2	50	0.2
Error	229	227	
Total	242		

* $P < .05$
** $P < .01$

Production, Inventory, and Performance Data, S-10 Herds 1967-68
Phase II, Fifth Calf Crop, and
Phase III Contract Matings

State Virginia, Pro.345011

Location		Shan. Val.	Res. Sta.	and Three P	rivate Herds	
Breed of Sire		Various	Various	Various	Purebred	Crossbred
Breed of Dam		Angus	Hereford	Shorthorn	Crossbred	Purebred
Line or Group[1]		Phase 3	Phase 3	Phase 3	Phase 2	Phase 2
Percent used in project		100	100	100	90	90
Inventory as of July 1, 1968	Cows 2 years and over	120	120	120	56	55
	Yearling heifers	0	0	0	0	0
	Bulls & Steers under 1 year	0	0	0	0	0
	Heifers under 1 year	0	0	0	0	0
	Bulls over 1 year	8	8	8	6	6
	Steers over 1 year	0	0	0	0	0
Repro. Perf.	Percent pregnant[2]					
	Calf survival percent[3]					
Postweaning Wean. Performance Perf.	Adj. ADG.[4]	PLEASE SEE ATTACHED REPORT				
	Av. type sc.[5]					
	No. of bulls					
	No. of heifers					
	No. of steers					
Slaughtered	No. of bulls					
	No. of heifers					
	No. of steers					
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments:
5 - Suggest S-10 scoring system; indicate if different.

BEEF CATTLE RESEARCH STATION
Front Royal, Virginia

I. PROJECT: S-031-5, AH Line Project d1-48(S-10)

The Improvement of Beef Cattle for Virignia Through Breeding Methods

II. OBJECTIVES:

The objectives of this investigation are:

1. To compare changes in performance and breeding values from two breeding systems; (a) single trait mass selection, and (b) the formation of intensely inbred lines for subsequent use in top and rotational crossing.

2. To evaluate selection criteria and procedures and to develop more precise and effective measures of quality and performance in beef cattle.

3. To simplify methods of individual, progeny, and sib testing so that the performance of breeding cattle can be evaluated at young ages.

III. PERSONNEL:

B. M. Priode, K. P. Bovard, R. C. Carter, E. J. Warwick, P. A. Putnam and W. T. Butts.

IV. ACCOMPLISHMENTS DURING THE YEAR:

1 - Scope and nature of work undertaken:

(a) Levels of inbreeding continue to increase without serious detriment to normal growth and development. A total of nearly 200 calves from next year's inbred matings will be 42, 35, and 26% inbred in the Shorthorn, Angus and Hereford breeds, respectively.

(b) Most selection matings in Shorthorns are now in generations 4 and 5. Those in Angus are in generations 3 and 4.

(c) Topcross testing of the six Angus lines -- four inbred and two selection -- was continued in cooperation with the Mississippi Station. Similar testing of the six Shorthorn lines was continued with the Blacksburg (Virginia) Station.

(d) Three years' winter feeding studies of pregnant and lactating beef cows with apple pomace were completed. They included estimation of levels and rates of DDT contamination and subsequent dissipation. Results are in preparation for publication.

(e) Over the past two years the limited breeding season was shortened from 75 to 60 days. This places further emphasis on fertility.

(f) Forty surplus cows were placed in a supplementary study of silages and non-protein (NPN) supplements for wintering brood cows.

2 - Research results:

(a) Second Snorter seen. An inbred Angus Snorter dwarf bull calf was born in late March. The calf is 7190 MA3, Fx = .33, produced by an inbred son-dam mating. The most likely source of the dwarf gene appears to be Prince Evident of Sunbeam 569440, five generations removed from the dwarf. This is the second highly inbred Snorter swarf born in the Front Royal Angus herd since 1963. Its phenotype was not grossly abnormal, but its lateral lumbar radiograph was typical of Snorter dwarfs, i.e., showing extreme wrinkling of the ventral surfaces of the bodies of the vertebrae. The dwarf's dam was used in 1967 to progeny test the current herd sire, 6096 A3.

(b) Cow weight analyses. Preliminary analyses of cow weights (N = 4652) showed the following formula to be useful in estimating a cow's fall weight:

$$\hat{Y} = 600 + 150\ X - 10\ X^2, \text{ where } X = \text{years of age.}$$

Largest effects in order of importance were: age, nursing status, inbreeding among inbred lines, years, and pregnancy status. Mature sizes of the essentially non-inbred cows in the selection lines were: Angus, 1167 lbs., Hereford, 1240 lbs; and Shorthorn, 1242 lbs. "Growth" cows were 12-24 lbs. "heavier" than type cows; dry cows were about 130 lbs. heavier than wet cows; cows 3-5 months pregnant were about 20 lbs. heavier than open cows. Weights were more than 200 lbs. heavier in "good" years than in "bad" years. The heaviest inbred lines were as much as 100 lbs. heavier at maturity than the lightest.

Mature size was defined as the point in the quadratic growth curve where weights began to decrease. This was between 7 1/2 and 8 years of age for most lines. Effects of inbreeding were large and negative for all inbred lines, small and negative for Angus and Shorthorn type selection lines, but small and positive for growth selection lines of both Angus and Shorthorn breeds.

(c) Calving dates differ. Average calving dates were affected by breed, and by mating system, but not silages fed during the winter of 1965-66. This was anticipated, since protein and energy consumption were equalized for all three groups. Angus calved about 9.5 days earlier than Herefords and Shorthorns, a breed difference larger than that usually reported. And, inbreds calved about 4.5 days later than non-inbreds. Mean values and the supporting AOV are presented in Tables 1 and 2.

(d) Young bulls conception rates compared. Do bulls used in natural service at Front Royal as yearlings and as two's do a better job their second year? This was a natural question after this last year's results. Results are shown.

Data presented are from bulls used in 1961-67, inclusive, but do not include yearlings in 1967. The results favor the two's over the yearlings by slightly more than 3%, and the selection bulls over the inbreds by about 7%. Neither finding was unexpected; neither was tested for statistical significance. The practical significance of these findings is another story.

Mating system	No. sires	No. matings	Per-cent calf crop Yearlings	Two's
Inbred	13	483	74.9	78.8
Selection	38	1382	82.6	85.5

Picking through the examples we can find bulls whose first year's service was unusually high, then dropped 10-15% or more their second year. And, the converse situation is also available. Variation among individual sire's results was wider among inbreds, partly because the size of breeding herds was much smaller.

V. FUTURE PLANS:

Continuation of the basic project as planned.

VI. PUBLICATIONS:

Bovard, K. P. 1967. Use of x-ray pictures in studies of Snorter dwarfism in cattle. Paper presented at 45th Annual Meeting of the Virginia Academy of Science, May 3-6, 1967 in Norfolk, Va.

Bovard, K. P., A. L. Eller, T. N. Meacham and B. M. Priode. 1967 Effects of size of iron on healing and legibility of cattle brands. Paper presented at the 45th Annual Meeting of the Virginia Academy of Science, May 3-6, 1967 in Norfolk, Va.

Bovard, K. P., and B. M. Priode. 1967. Genetic and environmental influences on beef Shorthorn cows' fall weights. Paper presented at the 45th Annual Meeting of the Virginia Academy of Science, May 3-6, 1967 in Norfolk, Va.

Bovard, K. P., J. P. Fontenot and B. M. Priode. 1967. Heptachlor residues in steers fed contaminated alfalfa. J. Animal Sci. 26:914 (Abstract).

Rumsey, T. S., K. P. Bovard, B. M. Priode and M. L. Crandall. 1967. DDT residues in beef cows fed apple pomace. J. Animal Sci. 26:880 (Abstract).

Krehbiel, E. V., R. C. Carter, K. P. Bovard, J. A. Gaines, and B. M. Priode. 1967. Reproductive performance of inbred beef cows. J. Animal Sci. 26:887 (Abstract).

VII. PUBLICATIONS PLANNED:

Bovard, K. P. and B. M. Priode. 1968. Estimates of beef cows' mature size from annual fall weights at Front Royal. To be presented at the Second World Congress of Animal Production, College Park, Md., July 1968. (In press). (Abstract).

Bovard, K. P., J. P. Fontenot, D. F. Watson and B. M. Priode. 1968. Heptachlor residues in beef cows and calves. J. Animal Sci. 27 (in press). (Abstract)

Gaines, J. A., R. C. Carter and B. M. Priode. Genetic correlation between feedlot gain and feed efficiency in beef cattle. (In press).

Meacham, R. N., K. P. Bovard, and B. M. Priode. 1968. Effects of supplemental vitamin A on the performance of beef cows and their calves. (In press).

Rumsey, T. S., K. P. Bovard, S. M. Shepherd and B. M. Priode. 1968. DDT residues in beef cows fed apple pomace. J. Animal Sci. 27: (in press).

Production, Inventory, and Performance Data, S-10 Herds - 1967-68

State Virginia

Location		Front Royal				
Breed of Sire		Angus	Angus	Angus	Angus	Angus
Breed of Dam		Angus	Angus	Angus	Angus	Angus
Line or Group[1]		A1	A2	A3	A4	A7
Percent used in project		100	100	100	100	100
Inventory as of July 1, 1968	Cows 2 years and over	17	20	19	20	34
	Yearling heifers	8	5	3	3	13
	Bulls & Steers under 1 year	6	7	5	4	12
	Heifers under 1 year	4	4	5	6	15
	Bulls over 1 year	2	3	2	4	3
	Steers over 1 year	-	-	-	-	-
Repro. Perf.	Percent pregnant[2]	88	88	74	67	94
	Calf survival percent[3]	100	73	86	83	93
Wean. Perf.	Adj. ADG[4]	1.86	1.66	1.78	1.56	1.87
	Av. type sc.[5]	12.2	11.2	11.2	10.3	12.5
Postweaning Performance	No. of bulls	3	3	3	2	4
	No. of heifers	8	5	3	3	13
	No. of steers	-	-	-	-	-
Slaughtered	No. of bulls					
	No. of heifers					
	No. of steers					
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatments, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments: age of dam, season of birth, sex and creep feeding.
5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1967-68

State Virginia

Location		Front Royal				
Breed of Sire		Angus	Angus	Angus	Hereford	Hereford
Breed of Dam		Angus	Angus	Angus	Hereford	Hereford
Line or Group[1]		A8	A9	Total	H2	H3
Percent used in project		100	100	100	100	100
Inventory as of July 1, 1968	Cows 2 years and over	32	-	142	23	23
	Yearling heifers	13	-	45	4	7
	Bulls & Steers under 1 year	13	-	47	11	9
	Heifers under 1 year	14	-	48	9	7
	Bulls over 1 year	3	1	18	2	2
	Steers over 1 year	-	-	-	-	-
Repro. Perf.	Percent pregnant[2]	91	75	85	84	88
	Calf survival percent[3]	97	100	91	81	93
Wean. Perf.	Adj ADG[4]	2.00	2.19	1.85	1.53	1.84
	Av. type sc.[5]	11.6	11.9	11.7	11.0	11.4
Postweaning Performance	No. of bulls	4	3(a)	22	2	2
	No. of heifers	13	-	45	4	7
	No. of steers	-	-	-	-	-
Slaughtered	No. of bulls	-	-	-	-	-
	No. of heifers					
	No. of steers					

Remarks (a) Includes 2 bulls on ROP test from outside breeders.

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (Dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments: age of dam, season of birth, sex, and creep feeding.
5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1967-68

State Virginia

Location		Front Royal				
Breed of Sire		Hereford	Hereford	Hereford	Hereford	Hereford
Breed of Dam		Hereford	Hereford	Hereford	Hereford	Hereford
Line or Group[1]		H4	H5	H6	H7	H8
Percent used in project		100	100	100	100	100
Inventory as of July 1, 1968	Cows 2 years and over	22	24	41	42	42
	Yearling heifers	5	5	9	13	10
	Bulls & Steers under 1 year	8	7	8	15	13
	Heifers under 1 year	7	7	12	12	11
	Bulls over 1 year	2	2	3	2	2
	Steers over 1 year	-	-	-	-	-
Repro. Perf.	Percent pregnant[2]	84	88	79	91	80
	Calf survival percent[3]	75	93	91	97	93
Wean. Perf.	Adj. ADG.[4]	1.74	1.68	1.72	1.76	2.10
	Av. type sc.[5]	12.0	11.6	11.4	12.4	12.0
Postweaning Performance	No. of bulls	2	2	4	3	4
	No. of heifers	5	5	9	13	10
	No. of steers					
Slaughtered	No. of bulls					
	No. of heifers					
	No. of steers					
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments; age of dam, season of birth, sex, and creep feeding.
5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory and Performance Data, S-10 Herds - 1967-68

State Virginia

Location		Front Royal				
Breed of Sire		Hereford	Hereford	Shorthorn	Shorthorn	Shorthorn
Breed of Dam		Hereford	Hereford	Shorthorn	Shorthorn	Shorthorn
Line or Group[1]		H9	Total	S1	S2	S4
Percent used in project		100	100	100	100	100
Inventory as of July 1, 1968	Cows 2 years and over	-	217	17	18	18
	Yearling heifers	-	53	3	4	9
	Bulls & Steers under 1 year	-	71	11	7	7
	Heifers under 1 year	-	65	3	6	4
	Bulls over 1 year	1	16	2	4	2
	Steers over 1 year					
Repro. Perf.	Percent pregnant[2]	100	85	64	62	78
	Calf survival percent[3]	25	88	78	90	93
Wean. Perf.	Adj. ADG[4]	1.59	1.80	1.67	1.75	1.76
	Av. type sc.[5]	10.4	11.8	11.0	11.6	11.6
Postweaning Performance	No. of bulls	3(B)	22	3	2	2
	No. of heifers		53	3	5	9
	No. of steers					
Slaughtered	No. of bulls					
	No. of heifers					
	No. of steers					
Remarks		(B) Includes 3 bulls on ROP test from outside breeders.				

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments: age of dam, season of birth, sex, and creep feeding.
5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1967-68 Va., F.R. 9

State Virginia

Location		Front Royal				
Breed of Sire		Short-horn	Short-horn	Short horn	Short-horn	Short-horn
Breed of Dam		Short horn	Short horn	Short horn	Short horn	Short horn
Line or Group[1]		S5	S7	S8	S9	Total
Percent used in project		100	100	100	100	100
Inventory as of July 1, 1968	Cows 2 years and over	17	37	32	-	139
	Yearling heifers	4	13	13	-	46
	Bulls & Steers under 1 year	2	12	15	-	54
	Heifers under 1 year	6	14	10	-	43
	Bulls over 1 year	2	3	3	1	17
	Steers over 1 year					
Repro. Perf.	Percent pregnant[2]	43	86	84	83	75
	Calf survival percent[3]	100	84	90	40	86
Wean. Perf.	Adj. ADG[4]	1.61	1.80	1.88	1.64	1.79
	Av. type sc.[5]	11.2	12.6	11.4	12.1	11.8
Postweaning Performance	No. of bulls	2	4	4	2	19
	No. of heifers	4	13	13	-	47
	No. of steers					
Slaughtered	No. of bulls					
	No. of heifers					
	No. of steers					
Remarks						

1 - Purebreds, grade, line,sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments: age of dam, season of birth, sex, and creep feeding.
5 - Suggest S-10 scoring system; indicate if different.

Production, Inventory, and Performance Data, S-10 Herds - 1967-68

State Virginia

Location		Front Royal				
Breed of Sire		Purebred	Various			
Breed of Dam		Purebred	Various			
Line or Group[1]		Herd Total	Cross bred			
Percent used in project		100	100			
Inventory as of July 1, 1968	Cows 2 years and over	498	-			
	Yearling heifers	144	-			
	Bulls & Steers under 1 year	172	1			
	Heifers under 1 year	156	4			
	Bulls over 1 year	51	1			
	Steers over 1 year	--	-			
Repro. Perf.	Percent pregnant[2]	82	87			
	Calf survival percent[3]	88	88			
Wean. Perf.	Adj. ADG[4]	1.81	1.86			
	Av. type sc.[5]	11.8	11.0			
Postweaning Performance	No. of bulls	63	8			
	No. of heifers	145	-			
	No. of steers					
Slaughtered	No. of bulls					
	No. of heifers					
	No. of steers					
Remarks						

1 - Purebreds, grade, line, sire number, crosses, treatment, etc.
2 - Use palpation percent of percent of cows that gave birth to calves (dead and alive). If palpation record is used, do not include those pregnant cows that were disposed of before calving.
3 - Percent of calves born (dead and alive) that survived to weaning. The product of percent pregnant and survival percent gives weaning percent.
4 - Indicate adjustments: age of dam, season of birth, sex, and creep feeding.
5 - Suggest S-10 scoring system; indicate if different.